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The Harkness Memorial Quadrangle, Yale University

The Architectural Plan*

By James Gamble Rogers, '89
Architect of the Quadrangle

IN studying the details of as large an operation as the Memorial Quadrangle, with its primal need of open spaces for air and light, it was first necessary to decide on a few general principles, such as the general effect, location of entrances, style of architecture, kind of trim, kind of field, size of rooms, character of construction, circulation, stairways, and hallways.

Preliminary sketch.

As this was to be a group of dormitories only, it seemed fitting that the general effect should be entirely residential, and as far as possible free from the blighting aspects of the conventional institutional or barracks-like structures.

To accomplish this to the greatest advantage, it first seemed necessary to introduce a number of small courts and to make all the buildings low, but this was found to be impossible because of the fact that one of the requirements was for the housing of at least a certain large number of students. No arrangement of small courts which would be of sufficient size and yet not appear cramped would give us anything like the number of rooms required.

The solution was found in a compromise of this principle; in making some small courts with low buildings around them, and some larger courts with high buildings; from this arrangement there eventually resulted the accepted group of six courts. To take full advantage of the sunlight, three smaller courts with low buildings will be placed on the southern (Library Street) end of the block, and two on the northern (Elm Street) end, with higher buildings and the largest court, or campus, in the middle, running through from east to west. The three small Library Street courts will be somewhat larger than the court of Wright Hall, but the buildings surrounding them lower, thus securing, I feel sure, sufficient air and light. The two northern (Elm Street) courts are wider than the court of Berkeley Oval. The main court, or campus, is about 150 feet wide and 260 feet long.

THE SIX COURTS

Then, to get the fullest advantage of the southern sun, the buildings at the southern (Library Street) end of the block will be made low, the remaining buildings increasing in height toward the north across the group.

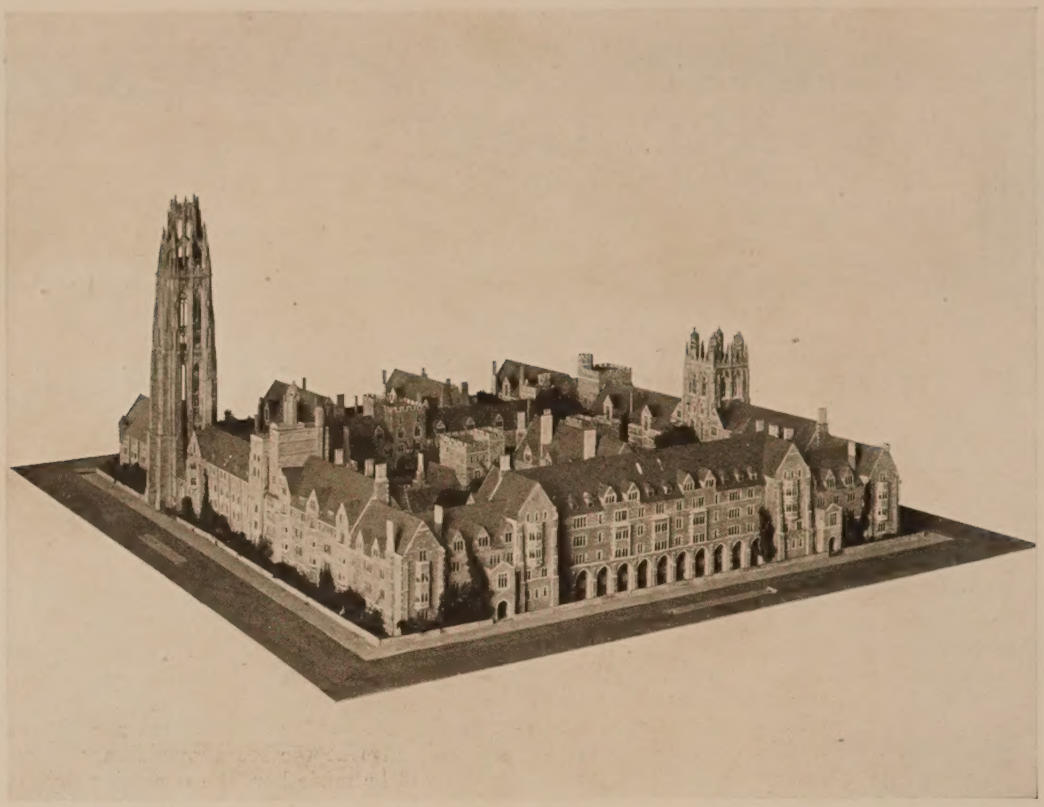
In order to allow the sunshine to enter as much as possible into the different courts, the buildings running east and west, from High to York Streets, are kept proportionately much lower than the others; here and there the roof is slanted a story lower on the north side to facilitate just that much more the greatly desired admission of all the sunlight possible.

As Yale has no well-defined general plan of the university to be followed, and therefore no definite main entrance, there is the difficulty of how to make entrances that will prove the most serviceable in the future. The principal entrance will be from the old campus side, on High Street, at a point opposite the present space between the Old Li-

THE ENTRANCES

Livingston Gateway and windows of Trumbull.

* From the address by Mr. Rogers when formally showing the university the model and drawings for the group of buildings.



The model of the Quadrangle.

brary and Dwight Hall. This entrance will be marked by the Harkness Tower and will open directly into a large court, or campus, giving an impressive effect through the central group on the north side and a picturesque view of the secondary tower that marks the termination of this court and counterbalances with the proper dissymmetry the Harkness Tower.

There are to be five other entrances, arranged not only for what seems the most probable use required of them now and in the future, but with the idea of also obtaining the best effect of the vistas. There will be six entrances in all: two on Elm Street, one on York Street, two on Library Street, and one on High Street. To prevent the too easy access to the rooms by possible sneak-thieves from the city streets, there is to be a wall around the whole group, and between this wall and the buildings there will be a sunken area, about four feet deep, which we hope will make it impossible for any one to enter the buildings except by the regular entrances.

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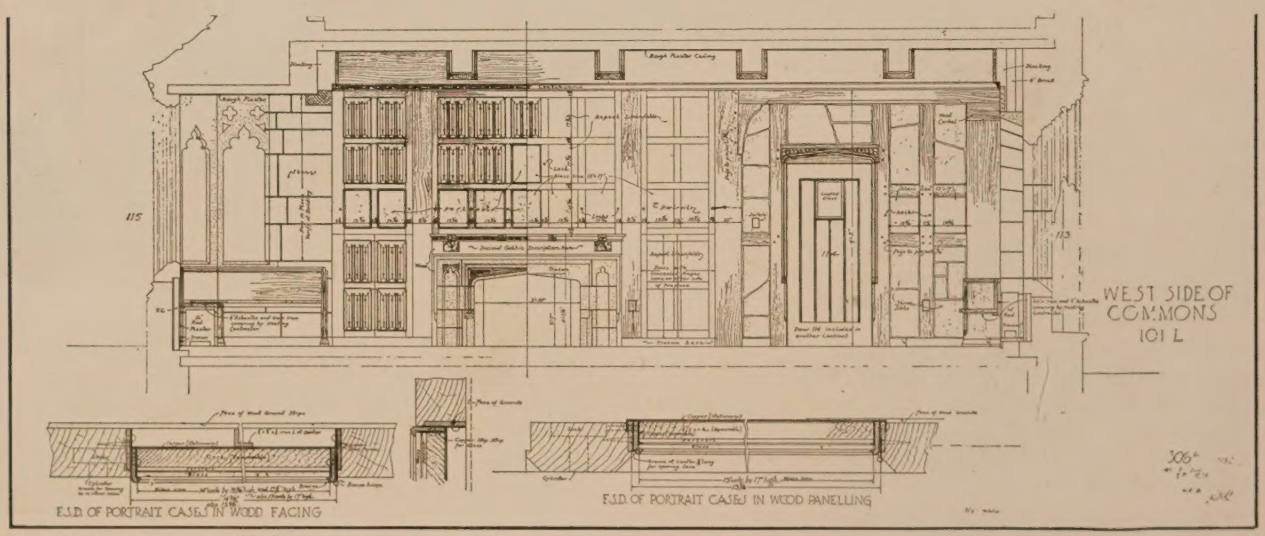
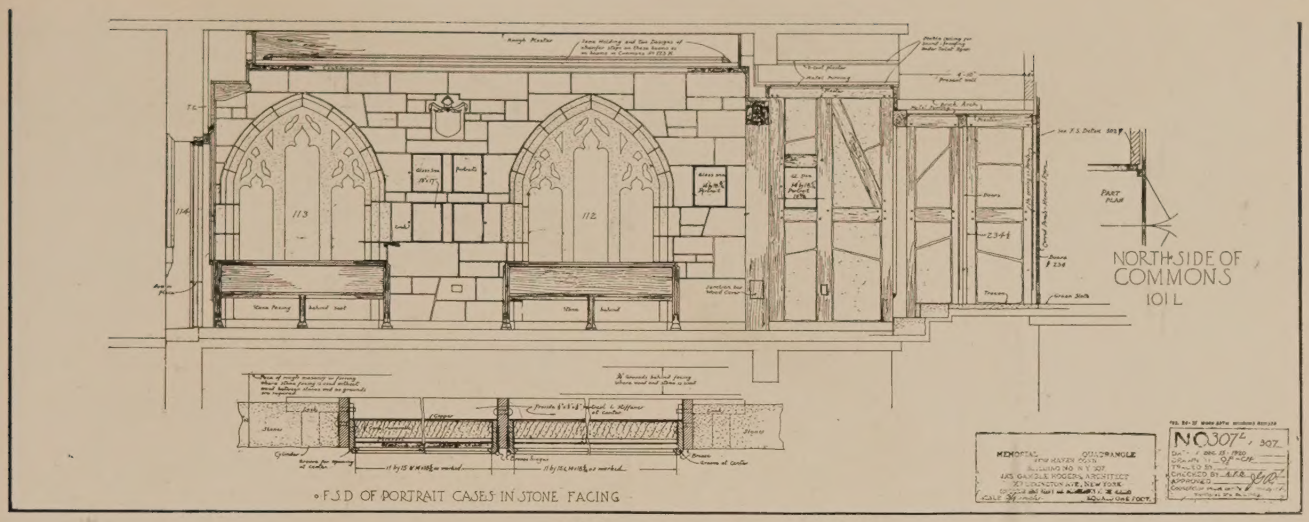
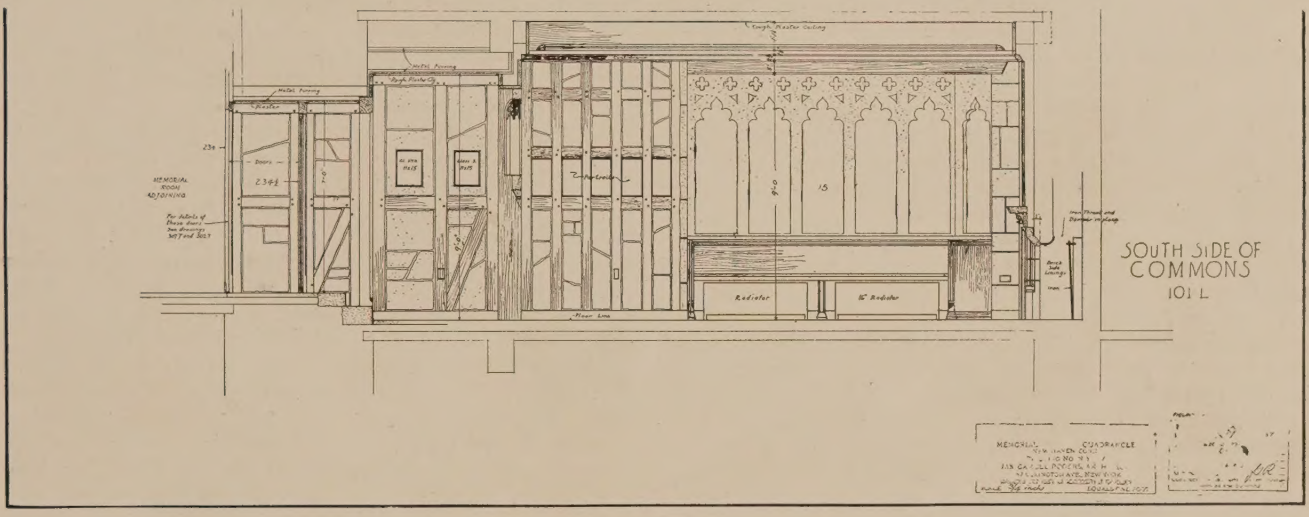
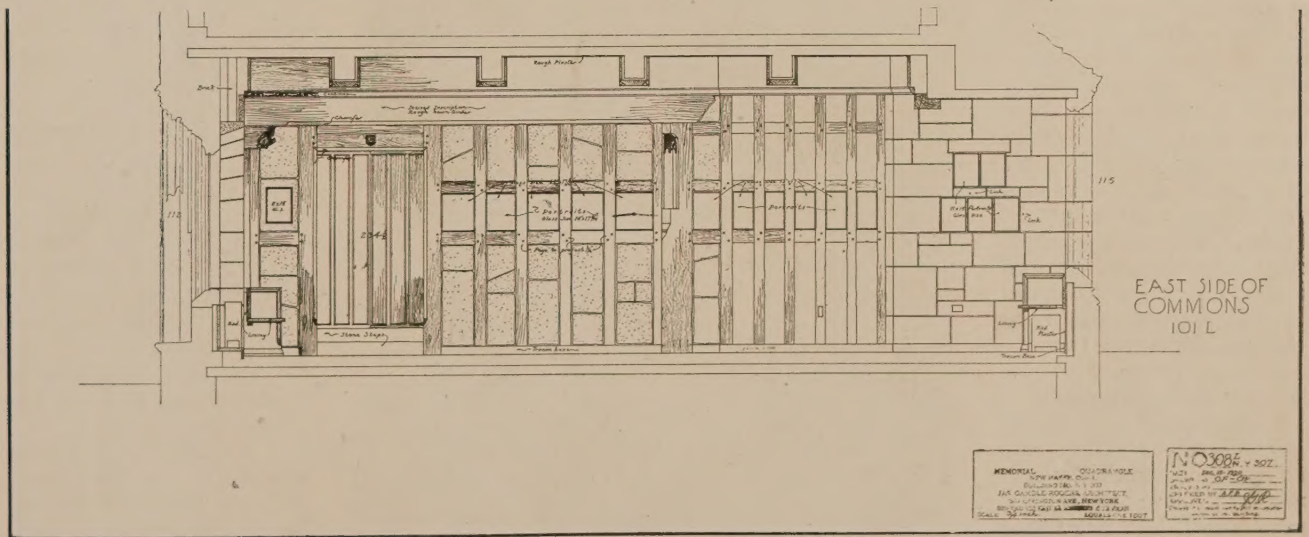


Details of Trumbull Commons.

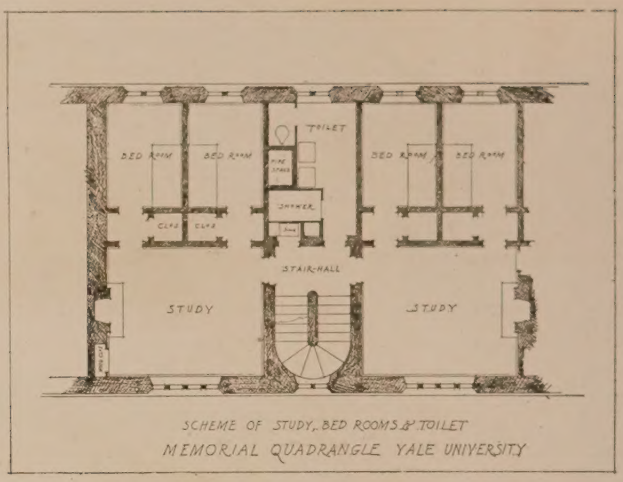






DETAILS OF TRUMBULL COMMONS.

Study for Commons.



(*Continued from page* 288.)

The university asked that the group be in the collegiate Gothic style of architecture—a good choice and a wise plan; and there was no sufficient reason for not making the buildings in that style. But as determining the style by no means determines the kind of material to be used, there was a large question open for study as to the kind of stone trim and field.

THE STYLE AND STONEWORK

Not from sentimental reasons, but purely to secure an effect of beauty, I determined at the start to endeavor to make the walls like the stone of some of the little islands between Saybrook and New London as they look in the afternoon when the sun shines on them. This, I felt, would give a warmth and cheerfulness that is so much needed during the season that the students are at New Haven. This particular stone, however, was not only impossible to get but was unsuitable to handle. But at any rate it was a definite idea to go upon, and it determined, in a way, the color that was wanted and therefore determined the kind of trimming stone that we should have.

A French stone answered this purpose because of its color and texture and durability—for centuries of exposure in building constructions abroad had shown that weather and wind had no other effect on it than apparently to make it a little harder. The location of these quarries, however, was so near the trenches, and the possibility of delays in shipping made it such a tremendous undertaking, that we had to abandon its use.

However, thoroughly searching the country—and I think I can truthfully say this, for we have had samples from Texas, Georgia, Colorado, Missouri, Kentucky, Wisconsin, Minnesota, Virginia, Ohio, Indiana, Connecticut, New Jersey, Massachusetts, Idaho, Alabama, North Carolina, Tennessee, and several other States that I have forgotten—we finally procured a stone that very nearly approximates the first ideal.

Study for meeting-room.

The size of the rooms was determined after a comparison with the usual college rooms; the dimensions chosen will be large enough for comfort and convenience, without being unnecessarily large and therefore reducing the number of rooms that could go in the space. For it is, of course, of the greatest importance that the number of rooms be as great as possible; that there be no waste of space and nothing so large that the care and upkeep will be out of proportion.

THE ROOMS

There are twelve hundred and sixty-six rooms in the entire group. These are arranged to house six hundred and thirty students. Generally they will be in the form of a study with two bedrooms. To accommodate the various requirements of the student, there are about one hundred and thirty single rooms and a number of suites of one study and a single bedroom. There are some groups of one study and three bedrooms. There are one hundred and sixty toilet-rooms in the whole group.

The studies are to be approximately fourteen feet square, and the bedrooms about eight by eleven feet. Single rooms have about one hundred and fifty square feet of floor area, though the dimensions are varied considerably in order to give a greater feeling of individuality to each room and to utilize the space to the best advantage.

The kind of construction chosen will be masonry walls and reinforced-concrete floors and columns, this being considered the best for dur-

Painted decorations on windows.

ability and protection. But the details are studied in such a way as not alone to secure fire protection but to insure the minimum of upkeep. The entry system was adopted without much discussion, and its many advantages for safety and convenience were so apparent that it was considered almost settled from the first. The stairs are as nearly fireproof as can be made, being of stone with an iron hand-rail and without any trim to the doors opening on stairs. The stairs are to be built in the old-fashioned way, the step being of a solid piece of stone supported by the masonry wall at each end.

THE GENERAL CONSTRUCTION

There are some interesting details about the planning of this great Yale group and the handling of the whole building operation wherein they differ from the general practice. Some might call this unbusinesslike, but wrongly, for it is one of those cases where I think the ideal will prove the most businesslike.

SOME GENERAL CONSIDERATIONS

Leaded windows in Cabinet Commons.

We are starting this building without knowing the cost. We do not know the final cost, but we do know that when we get in our bids for each trade we shall have that item complete and definite and therefore can get a more intelligent estimate than could be gotten should we take our bids before all the full-size details are made and every item determined on. This gives us the great advantage of being able, during the long time of putting in the foundations, to fully study the exact kind of mouldings and to make those ornamentation changes, improvements, and economies that come only from long study and care.

In order to get satisfactorily the stone jointing, texture, color, and mortar, we have had eight different walls built in New York City. When we obtained one that seemed correct, we had a larger one built in New Haven, where it could be studied in the same light and under the same conditions as will affect the permanent buildings. All this preliminary study costs money, but it is not extravagant nor wasteful, because it will in the end save many times the amount expended. We have already found that we can accomplish results in the kind of mortar used, and a saving that will more than equal the cost of all these preliminary operations. If, in addition, from knowing exactly what to do, we can make a slight saving in speed and avoid delays, the total saving will amount to considerable. For you must realize that there is a vast amount of these exterior walls. To give you an idea, I will state that the exterior wall surface alone just about equals a wall higher than the average house and one mile long.

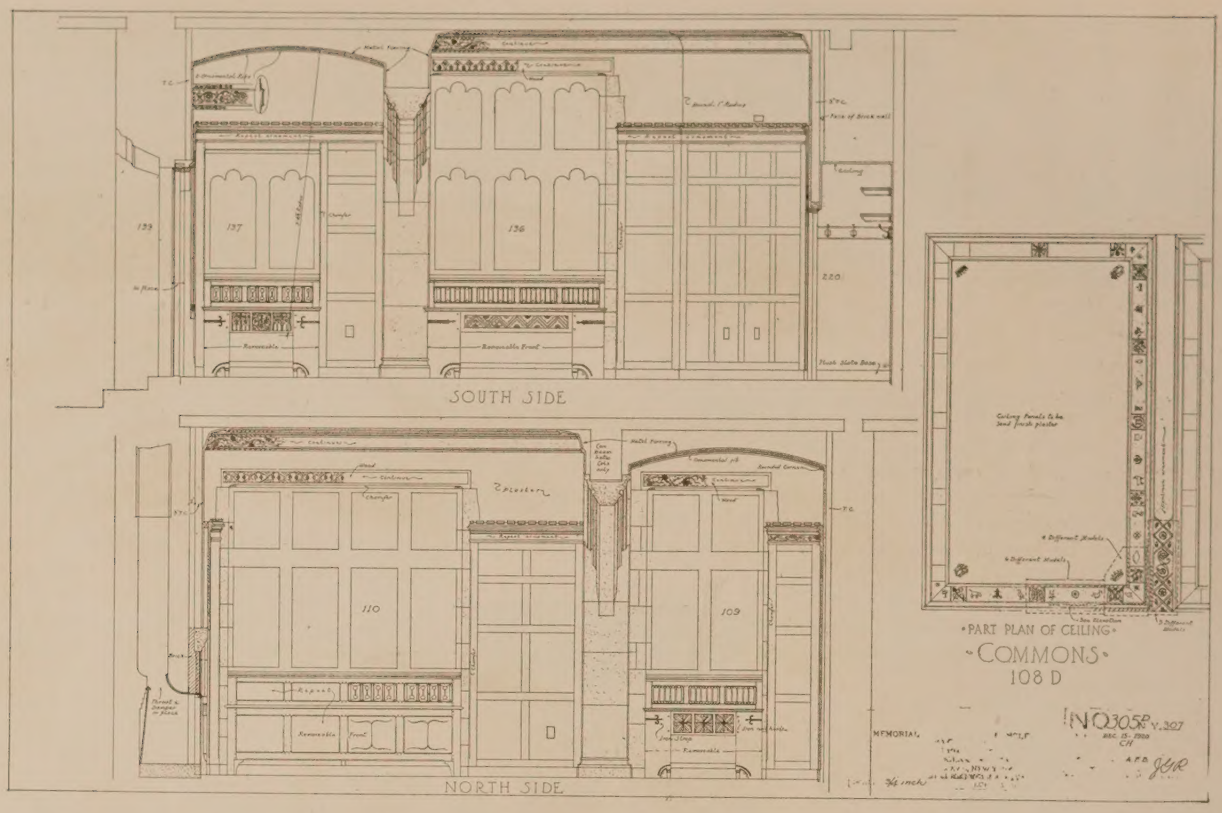
A preliminary sketch.

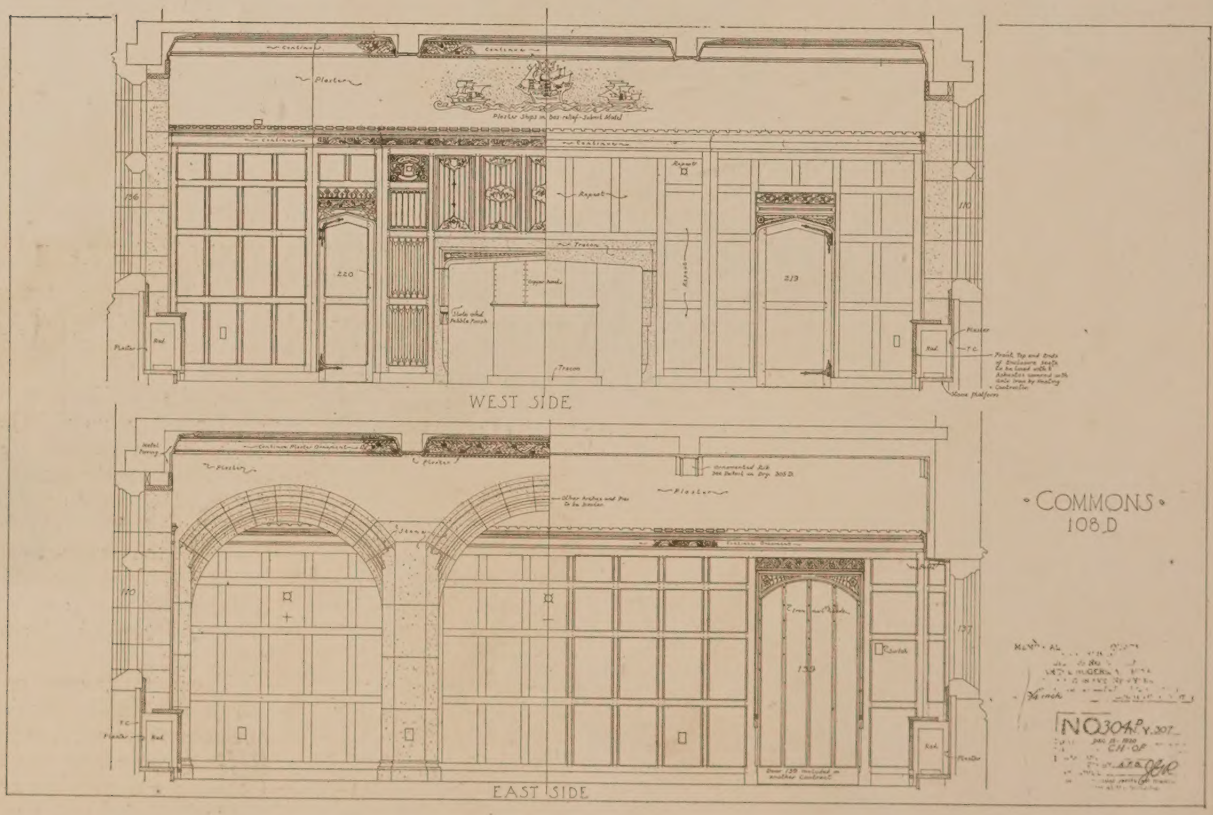
Another difference from the usual procedure of architectural operations was the way the plan was made. Instead of asking the university for various and numerous requirements, I asked only for the size of the lot and the number of rooms required, and then began a careful plan of what should go in such a building. After this I received from time to time requests for different things all of which I think have been incorporated. Only recently Mr. Stokes expressed the wish that we might in some way have a suggestion of Wrexham Church Tower, where Elihu Yale was buried. We readily changed one of the towers to Wrexham and in return asked him to get one of the stones from Wrexham Tower which would be built into our tower, thus tying the bond just that much closer. This is especially fortunate, for in many of its details and in its spirit it harmonizes with the main tower, the Harkness Tower.

The Harkness Tower is not another tower like the Magdalen Tower at Oxford; there are so many Magdalen towers in our universities, schools, engine-houses, and jails that we decided to avoid it if possible, and therefore on the Harkness Tower we have designed a "Couronne" tower as it has been shown in a very thin sort of a way in Saint Botolph in Boston, England, and in other towers abroad in a more substantial and dignified manner.

It is a sentiment that will appeal to all Yale men to have had the corner-stone laying for the Memorial Quadrangle on the two hundredth anniversary of the starting of the first building on the New Haven campus. In the foundation for the corner-stone are bricks and stones from the old buildings that were on the site of the Memorial Quadrangle.

There are numerous refinements, I mean old Gothic refinements, that prevent a factory-made appearance, which I think are more of an architectural study and not so suited to this article.





DETAILS OF LYCEUM COMMONS.

The Memorial Quadrangle of Yale University and the Harkness Memorial Tower

By George Nichols

King Entry, Branford Court.

WITH the completion of this new dormitory group, occupying an entire city square, and providing quarters for over 600 men, Yale College reaches the fulfilment of her long-cherished plan to house all of her growing body of students in campus rooms. The buildings are the gift of Mrs. Stephen V. Harkness, and the great tower, which is the architectural climax of the group, constitutes a memorial to her son, Charles William Harkness, a graduate from Yale in 1883, who died in May, 1916. The Quadrangle has been made a memorial to Yale's illustrious sons and to her historic past. The gateways are named for those leaders of early colonial life whose activities resulted in the establishment of "the Collegiate School" and its development into Yale College. The several towns where the college was founded and first conducted are recalled by the designations of the larger courts, while the thirty-seven entry doorways bear the names of distinguished graduates and mention of their achievements. Everywhere enshrined in ornament, inscription, and sculpture are the records of inspiring lives and noble deeds. Historic fact and mysterious legend, boyish fancies, song and jest, alike embellish the fabric and perpetuate the ideals and traditions of Yale.

The architect, James Gamble Rogers, himself a Yale man of the class of 1889, has been given an opportunity for architectural expression such as comes to few men. The success with which he has fulfilled the practical, artistic, and æsthetic demands of his commission becomes more and more impressive as the great Quad draws near to final completion.

What the architect's mental processes were at the outset was sympathetically reported to his expectant readers by Edwin Oviatt, editor of *The Yale Alumni Weekly*, while plans were taking shape, as follows:

"The problem was how to meet the requirements of a dormitory group in the Gothic style that would house over 500 Yale undergraduates on the entry system, which would fit into the feeling of the place and yet strike its own commanding note, but which, if that note was to be of the English college, should avoid the mechanical repetitions into which so many modern attempts at Gothic seem to fall. At one stroke there had to be secured something of that indefinable charm which the Oxford Colleges have gained only through centuries of weathering, and of successive buildings on original lines." Comparing the new Quadrangle with the old campus group, Mr. Oviatt said:

THE PROBLEM

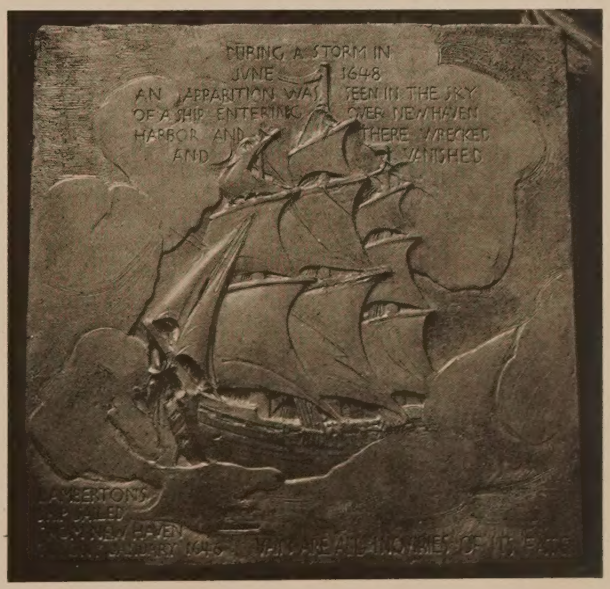
"The new Yale rising across High Street will be a more beautiful, a more intimate and lovable place—a retreat of courts and towers, entries and walks, of old English doorways and gables and Gothic windows—establishing, we may hope, in New Haven those ancient college quads which John Davenport knew at Magdalen and Merton and Brasenose, but which his successors in the building of the college he dreamed of have not until now brought to New England."

Mr. Rogers has said that first of all his desire was to make the buildings truly livable, and that with livableness should go cheerfulness, picturesqueness, and inspiration. The fact that architecture may minister to more than material needs was fittingly expressed by President Hadley, in his address of acceptance at the laying of the corner-stone, on October 8, 1917, when he said:

"A university is something more than a school, or group of schools. It is a complex of traditions and influences; of sentiments inherited from the past, and aspirations reaching out into the future. The lessons learned in its classrooms and laboratories constitute but a small part of the education which it offers. The students are taught and inspired by the example of those who have gone before them, and by the interests and ambitions of those that are about them. They breathe the spirit of the place. . . . Of the various means to develop and perpetuate this spiritual side of education beautiful buildings are one of the most important. . . . A monumental building, if it be really beautiful and glorious, gives a visible and permanent object round which life and loyalty can grow, and to which tradition and sentiment can attach."

Almost before the design had taken definite shape consideration was given to choice of materials. Connecticut brownstone held no charm for one who had spent four years among the sombre buildings of the old Yale Campus. There must be secured an enduring stone which would lend as much warmth and cheerful color as possible during the dark and

THE STONE



The Mystery ship.

stormy winter months, in which the buildings were to be most used. Mr. Rogers had long admired the golden brown of the rocks washed by the surf and glowing in the sunlight along the shore of the Sound near his summer home. While this particular stone was unsuitable for building purposes, there was found in the seam-faced granite of the Plymouth Quarries, along with the predominating golden browns desired, a wealth of other harmonious colors, which bring to the buildings an added and unusual charm. One enthusiastic admirer says of it: "And the quality of the stone! Who, I wonder, first thought of that stone? The warm rich color, the irregularities of its surface, its ease and geniality, remind one of the cheerful pattern of a homespun suit, whose idiosyncrasies, instead of being flattened, are emphasized." For trimmings the yellow, rust-veined Briar Hill sandstone was chosen, in friendly harmony with insuring abundant natural ventilation. Each entry, with its rooms on either side, is separated from the next entry group by fire-walls, extending from basement to roof. Toilet facilities for the adjacent rooms are provided on each entry stair-landing. The fire-escape problem is solved by fireproof passages through the attics, connecting one stairway with another, automatic fire-doors occurring midway in each passage.

The junctions of the various building units, with the accompanying necessity for appropriate emphasis in mass, the occurrence of entries and stair halls at certain required points, and the piercing of the units by the passages giving access and circulation have been cleverly availed of to secure numerous and interesting diversities in the plan and arrangement of the various suites.

The subdivision of the buildings and their grouping

Elihu Yale. Jonathan Edwards. S. F. B. Morse. James Fenimore Cooper. Eli Whitney.

SOME OF THE SCULPTURE ON THE HARKNESS MEMORIAL TOWER.

the granite in color and amenable to the carved intricacies of Gothic ornament. More will be said later of the wealth of harmonious color which the buildings possess, but as these fundamental materials were selected at the very beginnings of design, and play such an important part in the picture, they are mentioned prior to a consideration of planning and grouping.

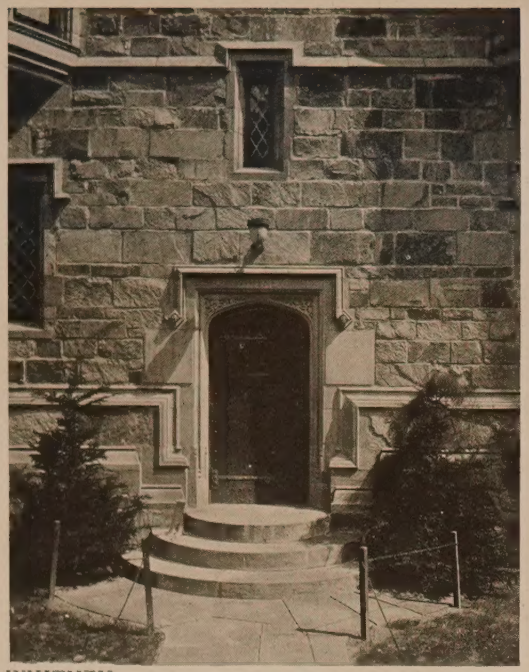
It is not difficult to conceive what dreary monotony would have resulted from a commonplace, unimaginative treatment of buildings composed of nearly eleven hundred small rooms. But notwithstanding the absence of large rooms or halls, which would establish main points of interest and form a basis for architectural grouping, there have been built up from the required small units a surprising number of pleasing compositions of dominant and subordinate masses, contrasting in outline and varied in detail. Every possible artifice in design has been employed to impart a definite and appropriate character to each part of a harmonious and picturesque whole.

ROOM AND BUILDING UNITS

The general arrangement of rooms is on the entry system, and the resulting units which surround the seven interior courts are of such width that the suites, consisting generally of a study and one to three bedrooms, extend through from street to court, or from court to court, thus around the courts has been governed by several considerations. Generally speaking, the buildings increase in height from Library Street on the south to Elm Street on the north, which feature, as will be noted later, is intimately connected with the design of the exterior fronts on the surrounding streets. Entering from High Street through Memorial Gateway, or from York Street through Mather Gateway, one arrives in the great central square known as Branford Court, which extends 131 feet north and south, and 271 feet east and west. The buildings being lower to the south, the courts around which they are grouped may be smaller, and still abundantly lighted. Therefore we find upon the Library Street side three courts, each approximately 51 feet by 67 feet. Two have entrances from Library Street, and all are connected with Branford Court by vaulted passages, pleasingly varied in material and design, the vault construction performing the real function of carrying the buildings above. On the Elm Street side are two larger courts, approximately 90 feet by 116 feet. One is entered from Branford Court through the vaulted portals and cloistered passage of a diminutive close, forming the forecourt of Wrexham Tower, the other through a vaulted passage near the

GROUPING OF BUILDINGS, COURTS, TOWERS

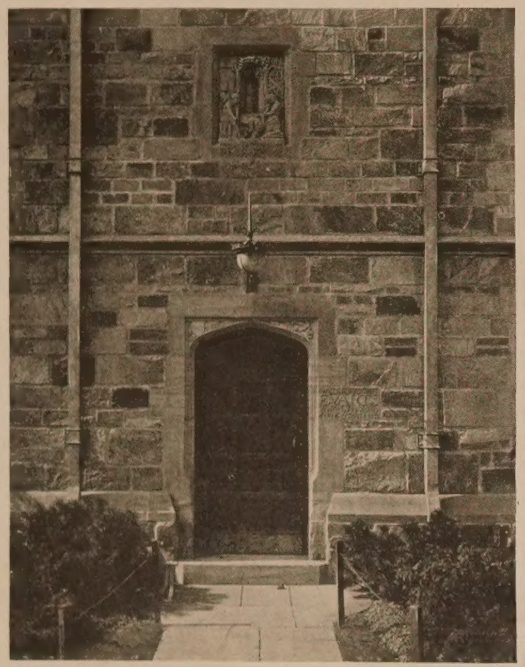
(*Continued on page 296.*)



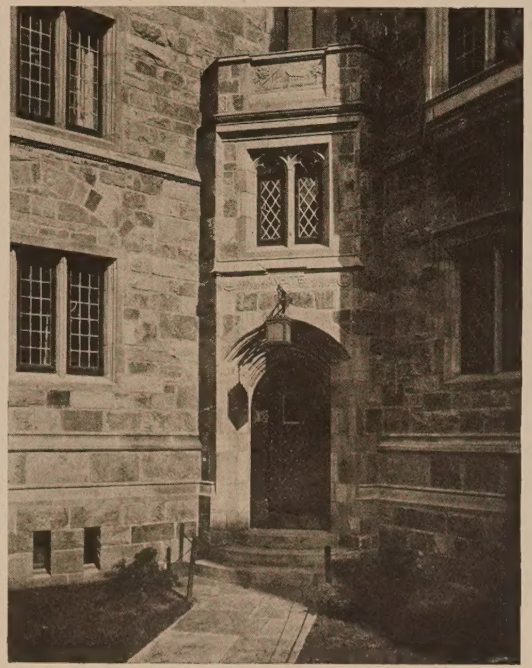
WHITNEY.

COOPER.

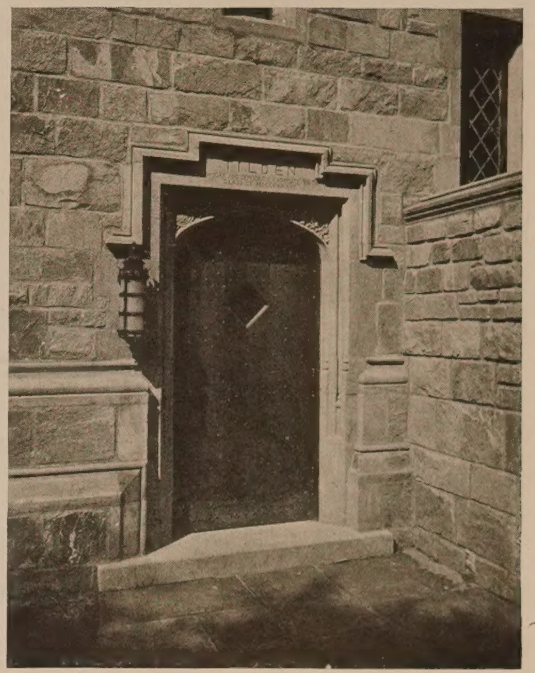
STILES.



EVARTS.



WHITE.



TILDEN.

James Gamble Rogers, Architect.

ENTRIES, HARKNESS QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.

"Lexington Minute-Man," Revolutionary War. World War. War of 1812.

SCULPTURE ON THE HARKNESS MEMORIAL TOWER

(*Continued from page* 294.)

northeast angle, and both are accessible from Elm Street through gateways taking the form of English "porches."

The buildings running east and west are relatively low, while those running north and south are high; furthermore, the buildings on the south side of each court are very low and always proportionate in height to the north and south dimension of the court. Thus in the small southern courts the southerly wall is only one story high, and in the northern courts two stories, with flat roof.

Certain departures from exact right angles in the corners of the plot have been utilized to the fullest extent, resulting in effective irregularities in alignment and grouping. None of the courts is, therefore, exactly rectangular, and increased variety of aspect has been given by playful but useful variations in the plan of entrances, stair-towers, bay windows, and the treatment of angles. Likewise the variations in levels of the surrounding street have been disposed in the courts and passages with artistic effect, and to the practical end of assisting surface drainage. The effects thus obtained have been further enhanced by the creation of terraces of greater or less height at various places, offering new points of view and different aspects.

The four corners of the great central court are appropriately emphasized by towers, varied in proportion and in detail as befits their relation to the great Memorial Tower at the southeast angle. Other towers fittingly accent the lesser masses of the composition, each a leading note in its subordinate group. The multitude of chimney-stacks, which the provision of a fireplace for each study makes necessary, is frankly welcomed, and treated with great variety of detail, suppressed or strongly developed as the profiles and groupings demand. The grouping of chimneys and gable ends terminating the high units appearing above the lower roofs is of additional interest.

The bird's-eye view of the model illustrates the system of grouping about the courts, the diversity of roof masses resulting, and the emphasis of the towers, chimneys, and gables in the composition. Many refinements were introduced subsequent to the time when this model was made, and this is particularly noticeable in the Harkness Tower. Excellent as are the groupings in direct elevation throughout, no one can appreciate, except by many visits to the Quadrangle, the great beauty and picturesque qualities of the perspective groupings which present themselves at every turn as progress is made around the buildings and through the courts.

Those familiar with Yale know that its grounds and buildings are an integral part of a busy city. To harmonize the Quadrangle with such surroundings, to maintain a scholastic and residential character with seclusion from the busier streets, and at the same time to unite it intimately with the university, where it closely approaches the old campus across High Street, were elements to be reconciled in the design.

EXTERIOR

The plot is approximately 354 feet from east to west, and 415 feet from north to south. The "entry system" having been adopted, access to the entries only from inner courts was decided upon. To secure adequate space in the inner courts and to keep all living-rooms within the desired limit of five stories, it was necessary that the outer walls should be placed relatively close to the street lines. Isolation, both apparent and real, is at once obtained by surrounding the buildings with an adaptation of the ancient moat, supposing it to be of that period when it was no longer required to be filled with water. Access to the inner courts is provided by bridges over the moat, pleasing features in themselves, and through tower gateways and English porches. In the moat opportunity is secured for an attractive screen planting of trees and shrubs, well protected from street traffic, and further enhancing the desired seclusion.

Allusion has been made to the different character of the streets surrounding the Quad. Let us note with what subtlety the street fronts have been adapted to their en-

(*Continued on page* 299.)

Editorial and Other Comment

The Harkness Memorial Quadrangle and Memorial Tower, Yale University

WE have in the buildings of a number of our American universities dignified and inspiring examples of what has been designated as Collegiate Gothic. The style seems especially appropriate and harmoniously in keeping with the purposes of a great university and with those reminiscences of the Old World schools of England that had their inception in the early days of the revival of classical learning.

There are those, however, who go so far as to decry any use of Gothic in these days when we have apparently travelled so far from Gothic traditions. Why Gothic? Why not something distinctively modern and American? But these seem futile questions to us in the face of such a noble achievement in Gothic as the Harkness Memorial Quadrangle, to overlook entirely certain questions of fitness, and to deny us the privilege of using the very things that have most signified in the past the spiritual and intellectual aspirations of the world.

No one who has looked upon the venerable buildings of Oxford and Cambridge ever forgets the impression made upon him. He carries away, if he has a receptive and properly sensitized mind, pictures and thoughts of the beautiful quadrangles, places shut apart from the world without, in which an atmosphere of studious seclusion exists, where the surrounding architecture seems to be the silent and fitting expression of the scholarly environment.

In the Harkness Quadrangle at Yale University the architect, Mr. James Gamble Rogers, has created, in keeping with the express wishes of the university authorities, a group of Gothic buildings that we believe will bear comparison with any in the world. Based primarily upon Tudor Gothic, they yet embody many varieties of the style and include, as a matter of fact, elements that the curious student will find tell practically the whole story of Gothic development. In many ways, notably in their details and picturesqueness, they are the most distinctive collegiate buildings in existence. There is a remarkable and enticing variety of design shown in their construction and the most surprising play of fancy. The two great towers, the Harkness Memorial Tower and the Wrexham Tower, will be admired and studied in detail by thousands of pilgrims to New Haven, and they have already excited the admiration of many architects from all parts of the country.

Mr. Rogers had the problem of placing his group in a residential and business section of the city, and he has done it in such a way as to harmonize it with its surroundings, and yet to separate the Quadrangle and give it almost the significance and distinction of a place set apart for his particular buildings.

Few will visit the Harkness Quadrangle without at once thinking of the notable buildings at Princeton designed by Day & Klauder that were shown in the February, 1918, number of ARCHITECTURE. This comment is not intended, however, in the least to suggest a comparison, for Mr. Rogers has given us something entirely distinct, and with a display of fancy and creative genius that cannot fail to excite anew the admiration and wonder of the observer. The great Harkness Tower with its delicate traceries and its sculpture is unique in being the only tower of its kind in this country. Only the Old World traveller will find it reminiscent of the lovely things he may have recorded in his European note-book. Rising high above the infinitely varied surrounding dormitory buildings, it has a delicacy and beauty in form and color that will excite the enthusiasm and admiration of every one who has the privilege of seeing it.

The color of the tower will excite instant attention. The way the stone is varied in color from the heavy base upward to the sky-aspiring top gives the impression that the architect had in mind from the very beginning a composed color scheme that should express and carry out the idea of the tower itself. From the heavier tones below, the stone gradually gives place to lighter colors until the lantern and crown are entirely in the lovely soft cream tones so expressive of the sculpture and delicacy of the carvings and other ornament placed there.

One thought that will occur to many visitors will be that Mr. Rogers has embodied in his architecture as much variety, as much difference in the character of its details, as will be manifested in the characters of the fortunate young men who will have the delectable privilege of spending their student years in such an environment. A study of the details will show moods of playfulness, humor, sarcasm, satire, inspiration, poetry associated with undergraduate life—the whole gamut of youthful human emotions.

A student of Gothic architecture need not be told that in the very diversity of construction are to be found some of its greatest charms. Even a brief glance at the buildings will show evidences of their wide diversity not only in the roofs and passages but in the windows and doorways, arches, gables, chimneys, dormers. Young men who dwell there, the whole student body, will have an unfailing school of Gothic architecture before their eyes, and with this the inspiration that comes from being intimately associated with a work of such remarkable beauty and distinction.

In the color of the stone, the picturesque variety of mass, line, and detail, in the cosiness and intimacy of the rooms, retirement and semiseclusion of the smaller courts, in the graceful arching of the old elms in keeping with the buildings, in the passing shadows on the lawns, there is a pervasive and eloquent charm. It is in the very absence of stiff and rigid uniformity that we are made to feel a mood of buoyancy, of cheerfulness, of youth. Invention, design, and careful thought for every detail are evident everywhere,

but as well a suggestion of spontaneity, the development manifested in the progress of the work itself that embody the very essence of the old Gothic buildings. The men on the work became imbued with this spirit, and their pride in their skilled artisanship was voiced recently by one of them who referred to the Quadrangle as "our buildings." From beginning to end this was the general attitude—a fine sense of co-operation and of personal responsibility. The ideals of the past were revived in contact with the inspiring and beautiful old forms. Yale may well take pride in her Harkness Quadrangle and the towers, and, fortunately, in her possession we can all share.

Mr. Rogers has built a monument of enduring fame to the memory of Mr. Charles W. Harkness and his family, to whose splendid generosity the university owes the gift of the Quadrangle and its lovely Memorial Tower, and written his own name large in the annals of his Alma Mater and in the history of our collegiate architecture.

Acknowledgment

IN gathering the material for the presentation of the Harkness Quadrangle in this number, we have been especially favored in having the cordial co-operation of all concerned. Without this very personal help, we should have been quite unable to have given such a comprehensive impression of its inception, progress, and completion. We wish to express our thanks to Mr. Rogers and the gentlemen of his office who have contributed to the issue, and to Mr. George Nichols, to whose courtesy and help on our visits to New Haven we are particularly indebted. We also appreciate fully the interest and aid of the builders in furnishing us with facts concerning the details of construction. Our especial thanks are due to Mr. James S. Hedden, superintendent of construction at New Haven, to Mr. F. S. Sutton and others of Mr. Hedden's office in charge of particular work.

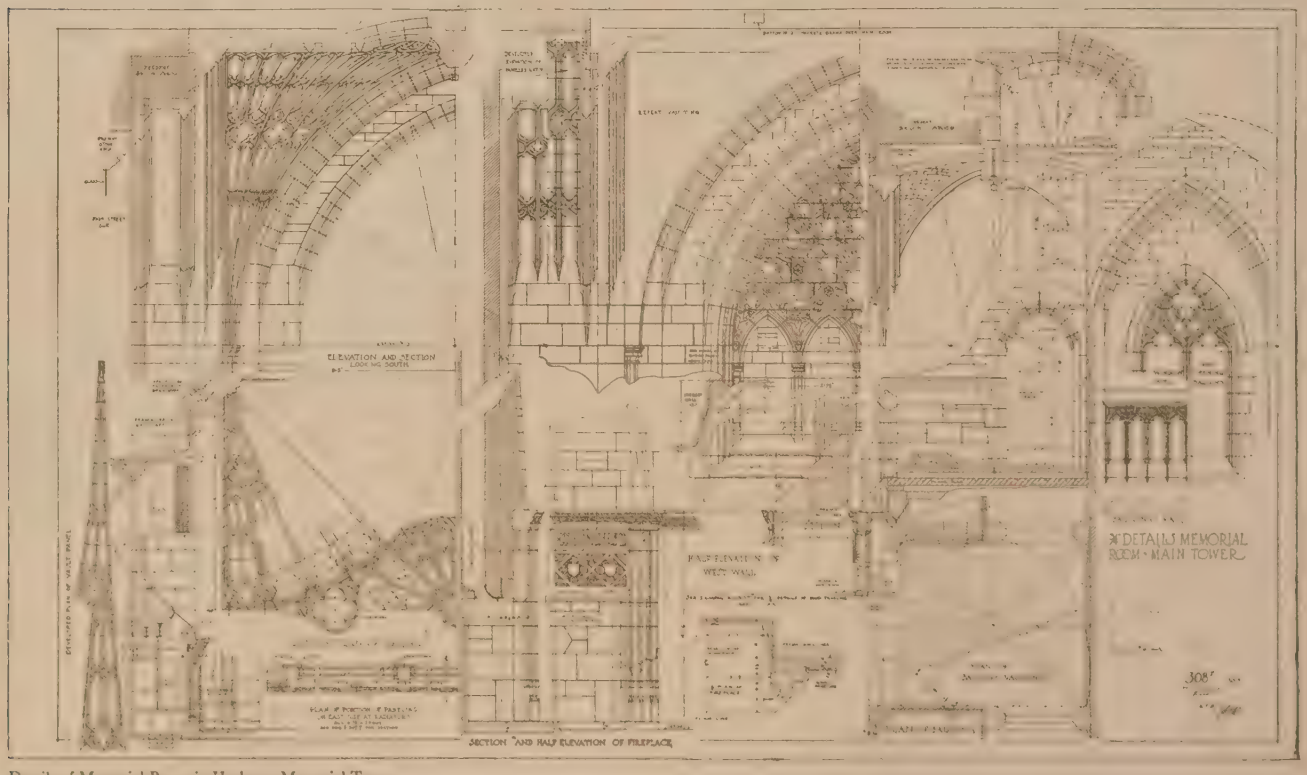
We ourselves brought from the contact with these men and the place a new sense of the inspiring value of being associated with such a really great building enterprise. The carrying out of the architect's ideas, meeting and overcoming the exceptional and difficult problems of construction involved, the distinction of the sculpture, the delicate, intricate stone-cutting—everything that expresses the beauty, power, and artistry of the buildings would not have been possible without the submergence of much of the merely business aspects of the performance into something higher. Architect and builders alike pay tribute to the splendid pride and spirit dominating the workmen of every grade. The men were "on the job" not only for wages received, but found the additional satisfaction of feeling that their own work contributed essential elements to the artistic success of the whole development.

In Early Numbers

THE editor wishes to announce the early resumption of the valuable series of articles by Mr. Pond and Mr. Walsh and the beginning of an interesting series of articles on some of the great French decorators.

In keeping with our policy we shall continue to devote considerable space to small houses and housing developments in general. We believe that every one of our readers will value this special October number, and there has already been such an unprecedented demand that we have been compelled to print an extra large edition.

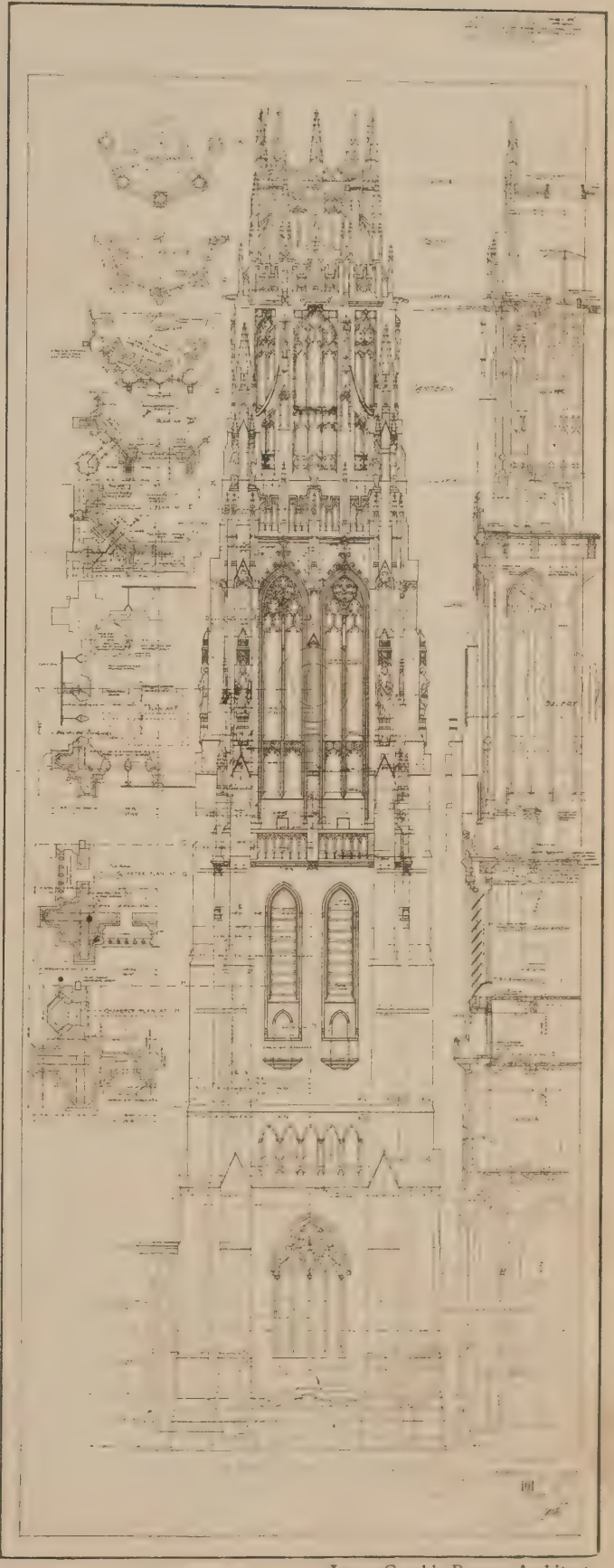
In spite of a constant increase in our printings of late we regret that we have been unable to fill all requests for recent issues.



Details of Memorial Room in Harkness Memorial Tower.

BRANFORD COURT AND HARKNESS TOWER. James Gamble Rogers, Architect.

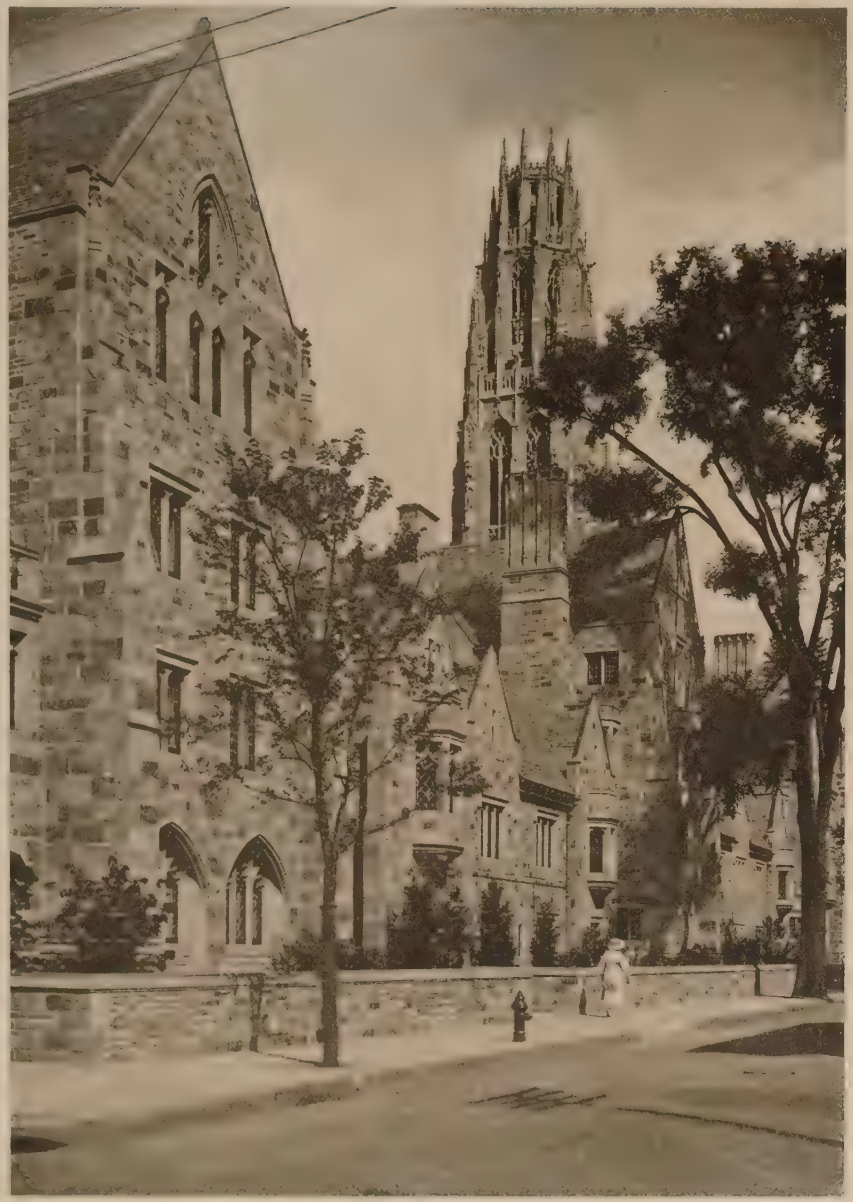
HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.



DETAIL AND ELEVATION OF HARKNESS TOWER.

James Gamble Rogers, Architect.

HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.



LIBRARY STREET AT YORK.

KILLINGWORTH COURT.

James Gamble Rogers, Architect.

HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.

TOURELLE AT NORTHEAST ANGLE OF BRANFORD COURT. James Gamble Rogers, Architect.

HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.

MEMORIAL GATEWAY FROM BRANFORD COURT. James Gamble Rogers, Architect.

HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.

MASON ENTRY—BRANFORD COURT. James Gamble Rogers, Architect.

HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.

LIBRARY STREET FRONT.

HIGH STREET.

ELM STREET. James Gamble Rogers, Architect.

HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.

BRANFORD COURT PORTALS OF PASSAGE TO CALLIOPE COURT.

BRANFORD COURT PORTAL OF FITCH GATEWAY.

HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.

James Gamble Rogers, Architect.

SOUTHWEST ANGLE, KILLINGWORTH COURT.

NORTHWEST ANGLE, BROTHERS-IN-UNITY COURT.
Statue of Noah Webster in niche.

HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.
James Gamble Rogers, Architect.

NORTHEAST ANGLE IN LINONIA COURT.

NORTHWEST ANGLE IN SAYBROOK COURT. James Gamble Rogers, Architect.

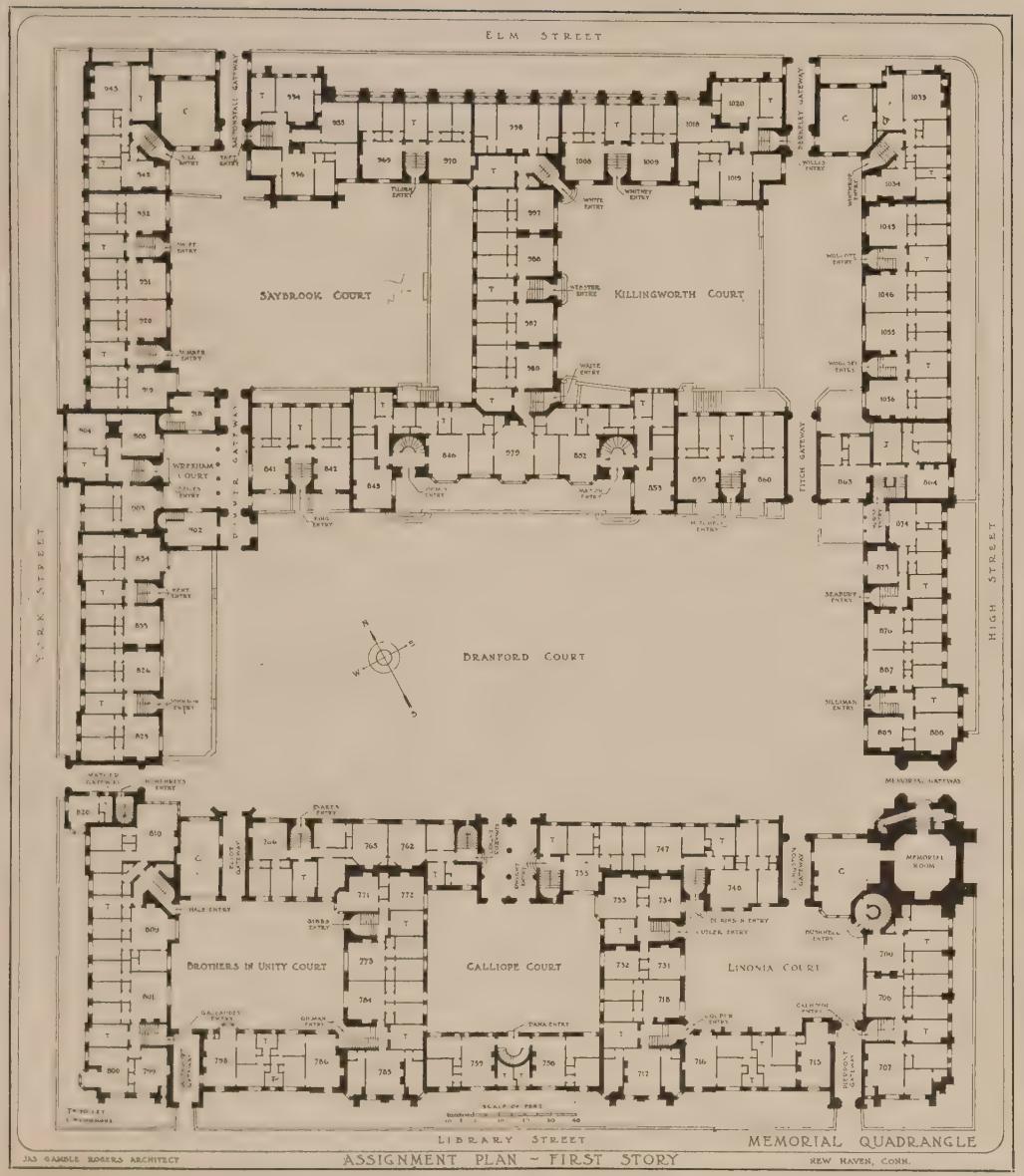
HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.

SOUTHWEST ANGLE, BROTHERS-IN-UNITY COURT, DAVENPORT GATEWAY.

SOUTHEAST ANGLE, LINONIA COURT, PIERPONT GATEWAY.

HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.

James Gamble Rogers, Architect.



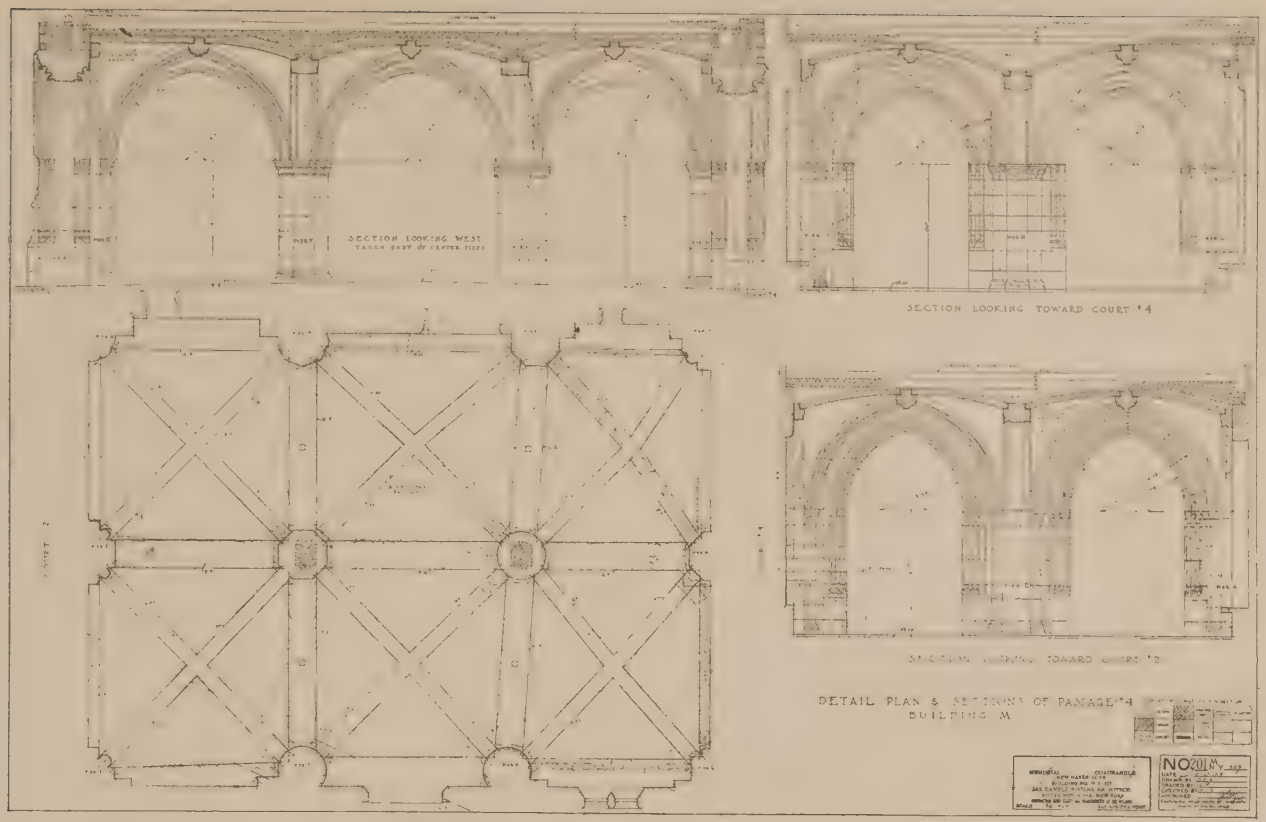
DETAIL OF STONEWORK. James Gamble Rogers, Architect.
Sculptured Portrait of E. Donald Robb, Assistant in Gothic Detail.

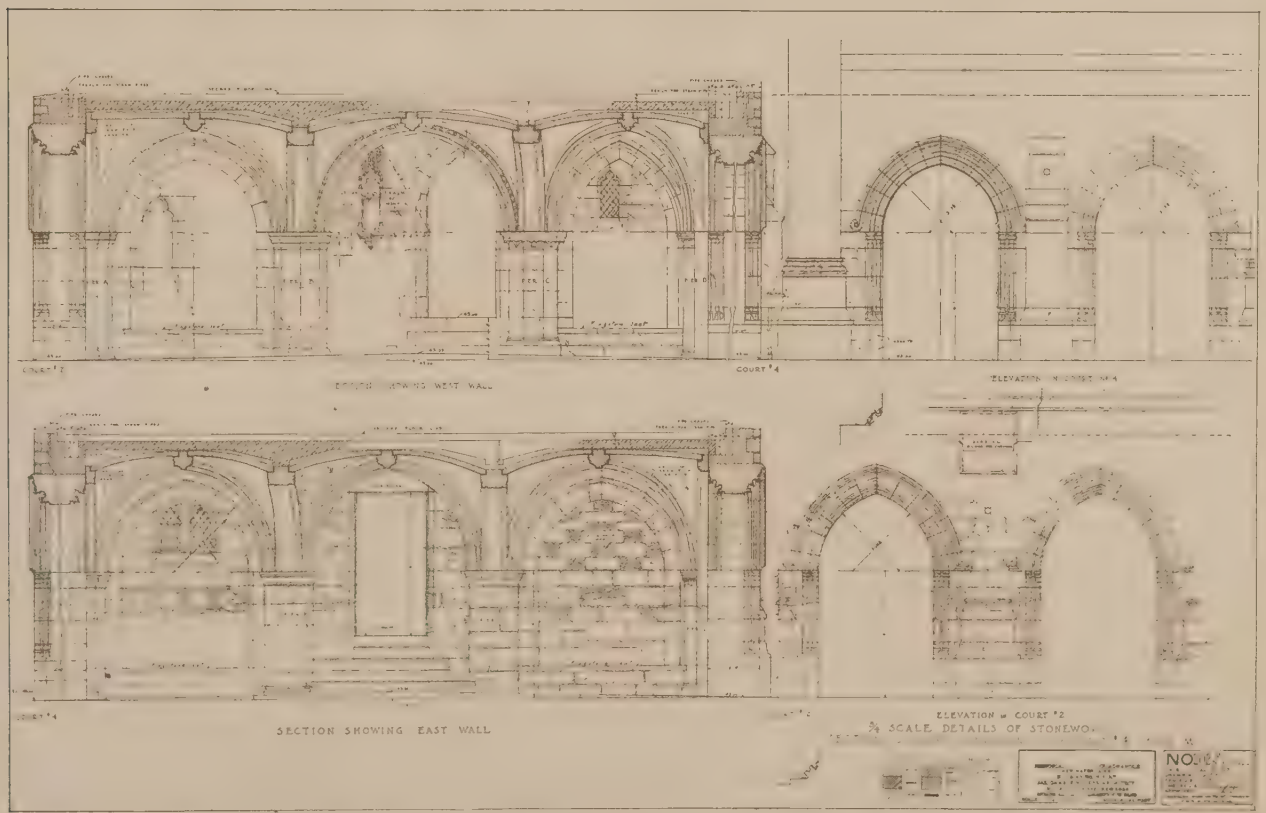
HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.

PRELIMINARY STUDY FOR TRUMBULL COMMONS.

PRELIMINARY STUDY FOR TRUMBULL COMMONS. James Gamble Rogers, Architect.

HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.





PLANS, SECTIONS, AND ELEVATIONS OF PASSAGE. James Gamble Rogers, Architect.

HARKNESS MEMORIAL QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.

Construction of passage to Calliope Court.

(*Continued from page 296.*)

vironment. Library Street is a secluded byway, one block in length. Here the moat is deep and its enclosing parapet low. From Library Street north on York toward the busier Elm Street the moat becomes shallower, but the first-floor level rises, and with it the enclosing outer wall of the moat. The same change occurs on High Street, but the parapet is here modified by a low section opposite the opening to the old campus, serving to bring the new buildings into more intimate relation with it.

At the corners of Elm Street the parapet reaches its greatest height, accompanied by the highest elevation of the first-floor level. The central section on Elm Street, however, is very low and broad, anticipating future conditions with which this height will accord. Here the buildings are withdrawn to a greater distance from the street line as compensation for the lessened protection of the low parapet.

Observe now how the character of the architecture itself is harmonized with the character of the respective streets. In quiet Library Street the long, low, two-story buildings are broken only by the high gables of the units running north and south, which serve to accentuate rather than destroy the horizontal lines, since they stand well back from the unbroken stretch of moat wall. The detail of the buildings is delicate and simple, early in period, and intimate and rural in its feeling. On York Street there is a gradual transition from this atmosphere. As Mather Gateway is reached a stronger note appears, which is increased by the sturdy treatment beneath Wrexham Tower. Beyond this point the highest buildings of this façade occur, and their detail is increasingly simpler and bolder as Elm Street is reached.

Vaulting of passage to Calliope Court. Sample wall and roof in background.

On Elm Street the highest and most rugged characteristics obtain. Later Gothic details and early Renaissance touches are interwoven. The gables are advanced to the street line, and the strong vertical lines of their buttresses are made visible from bottom to top. This front is a symmetrical composition, its terminations strongly defined by the towering gables and buttresses and the projecting porches of Saltonstall and Berkeley Gateways. The lowest story of the central portion is made up of a series of eleven great traceried openings, massive in scale and topped by a strongly marked string-course striking a sharp horizontal note in contrast to the vertical masses of the terminating gables. This repeating arcade, behind which the first-story wall is recessed, as if for an ambulatory, in all but three openings, serves the practical purpose of concealing the irregular fenestration of the numerous small rooms behind its recessed wall, and at the same time creates a large-scale horizontal motive in keeping with the character of the street.

Passage to Calliope Court.

City conditions in High Street are happily less in evidence than on Elm or York. There is much less traffic, and no cars. It is occupied for several blocks by university buildings, and the west side of the campus opens invitingly. The dominating feature of the Quadrangle, the Harkness Memorial Tower, has been located opposite this opening. To the south of the opening stands the old library, in itself a venerable and interesting example of early American Gothic architecture. It is intended that the opening to the campus shall be enlarged by the removal of Dwight Hall. This will leave the north side of the opening flanked by Wright Hall, a modern Gothic building not inharmonious with the Quadrangle. Thus the Harkness Tower is now in full view from the campus, and will later be seen between two buildings similar to it in fundamental character. Approaching across the campus the mighty uprush of its splendid shaft is in view from the first spring of its great buttresses to the graceful pinnacles of its lace-like crown. So the tower dominates both the old college and the new Quad, and links them inseparably.

Against the north side of Harkness Tower stands the Memorial Gateway, a feature subordinate in size to the other elements of the High Street front, but withal a mighty arch, emblazoned and decorated with an intricate display of Gothic ornament. Thus asserting its importance as the principal gateway, it invites approach from the old campus and entrance into "the intimate retreat of its inner courts."

It is interesting to observe the devices by which the buildings adjacent to Harkness Tower have been brought into harmony and scale with its massive lower stories. To the south is a building which might have been an old church or lofty hall. Between its heavy buttresses appears the side-aisle of its nave, while above are large mullioned windows, the middle section of which the designer has happily been able to fill with a rough walling so that the floor of his third story of dormitories might be carried through. The sexton's stair turret appears near the corner, terminating the hall with vertical emphasis, and rising into a pinnacle which echoes to the best of its ability the rising lines of the tower. A large-scale unit in the design has been achieved, which nestles against the tower without loss of dignity. To the north of the tower we shall see the same device of filling the central openings of the large window groups of a great hall. Separating this unit from the next is the tower-like seven-story building which marks the northeast angle of Branford Court within the Quad. By clever devices our eye is led upward along its sturdy walls, still upward to its towering chimneys, and finally to the "jewel tower" above it all; a fair reward indeed for the aspiring sight, and a lovely echo of the more majestic beauty of its master neighbor. A lessened vertical emphasis appears in the two-story bays of the succeeding four-and-a-half-story building, whose northern gable supports a chimney of emphatic height and interest. Beyond a lower building is carried to the Elm Street corner, stepping down nicely to the high parapet wall, with an amusing corner balcony beside the tall shaft of the final chimney.

And if from Elm Street this front is viewed in sharp perspective, or if a similar view-point from beyond its southerly end at Library Street is taken, one of the most effective artifices of its design becomes apparent. At each side of the Memorial Tower all horizontal lines have disappeared, hidden between the projections, and the mighty buttresses of the tower rise amid a multitude of echoing vertical lines, to which the pinnacles and chimneys add their spirited accents against the sky.

The great pointed arch of the Memorial Gateway stands slightly recessed between the rugged buttresses of Harkness Tower and the rough walls of the adjacent dormitory unit. It is entirely of Briar Hill stone.

MEMORIAL GATEWAY

The transition from granite walls to the portal is accomplished by a surrounding frame of flanking niches, their traceried canopies and crowns coupled by a strongly moulded string-course and surmounted by a decorative attic; a striking composition of vertical accents in light and shade. The archway itself is defined by numerous ornamented mouldings, the chief of which is embellished with miniature sculptured groups, typifying the various schools of the university, the figure of Alma Mater occupying the centre. Above is inscribed "For God, for Country, and for Yale," the concluding line of "Bright College Years," the song dear to all sons of Eli. Another Yale song is recalled by the entwined thistle, rose, shamrock, and elm carved on the central boss of the vaulted ceiling within the portal.

In the south wall of the gateway a vestibule opens, leading to a lofty vaulted chamber within the tower, which is lighted through the great traceried window forming a feature of the High Street front. This room will be used for meetings upon special occasions, and will contain, in some practical, unostentatious form, a memorial to Charles William Harkness. Entered from the vestibule to the memorial room, a spiral stone stair within the tower buttress leads to a gallery, and thence upward to a meeting-room, which finds place above the Memorial Gateway. These rooms within the tower are the only portions of the Quad not yet completed.

The inner face of the Memorial Gateway bears a wealth of Gothic tracery above its arch. In the centre are the arms of the university, flanked by those of Connecticut and New Haven. In the central panel the twining tendrils of a conventional growing vine frame several miniature sculptured scenes which depict the planting of the class ivy in successive historic periods. The band of Indian scouts peering through the Gothic foliage at the ceremonies of 1703 is but one of many delightful whimsicalities to be found throughout the sculptured ornament. Within the arch-mouldings the seven leading athletic sports are portrayed by the hand or foot, alternating with clusters of ivy, oak, laurel, and other symbolic foliations.

Beautiful as are the street fronts, and engaging as is the welcome of the Memorial Gateway, the visitor emerging into Branford Court, the great central square of the Quad, will view with delight and astonishment the scene which presents itself. "There is something like a spiritual revelation to have such loveliness in the midst of a town—to step from a twentieth-century street into the thirteenth century, to exchange the busy ways of commerce for the seclusion of academic shades. . . ." Surrounding us are walls of that colorful seam-faced granite which has been spoken of. In the street fronts its rugged strength has been emphasized by suitable form and scale; here we see it adapting itself with increased beauty to the environment of spacious lawns and the caress of clinging shrubbery. This wall sparkles in full sun, that glows with color veiled in shade, while upon others the shadows of the elms cast their bewitching tracery.

INNER COURTS

Following the quaintly flagged paths about the court it becomes apparent that to carefully considered grouping has been added the charm of a skilful contrast in the profile and detail of each main and subordinate group. The increase in height of the buildings from south to north, which produced three courts on the south and two on the other side, permits the two sides of the central court to be contrasted interestingly in plan. In the centre of the south side is the double portal of Calliope Court, forming the first story of a battlemented square tower, which is brought forward and forms the central feature of long two-and-a-half-story buildings, at either end of which are the gateways to Linonia and Brothers-in-Unity Courts. The opposite mass on the north side is without a central opening, and is recessed, enclosing between its terminating wings a raised terrace, which may be used for outdoor plays and as a rostrum for meetings. The effect of an amphitheatre has been simulated by the disposition of the flagged paths, which curve in toward the central terrace at each side. In this central building will be observed a mingling of early renaissance forms with the late Gothic, further touches of which occur more frequently in the northern courts. Here again the expedient of gaining increased and dominant scale by fenestration simulating the presence of a lofty hall is carried out in a succession of beautiful mullioned and traceried bays.

The westerly buildings in Branford Court, and the

easterly as well, are quiet compositions as befits their shorter length and their closer connection with the great and lesser towers. The means by which these connections are established are varied. In one angle an arcaded screen is introduced, in another it is accomplished by the low units advanced to form the forecourt of Wrexham Tower, and elsewhere by other devices of plan.

All about us are the doors to the so-called entries, or stair halls, giving access to the rooms. Each is inscribed with the name of a distinguished graduate, and the accompanying sculptured ornament is symbolical of his achievements. The names of the entries are alphabetically arranged, the series beginning at the base of the Harkness Tower in Linonia Court. The portals of the passages leading to the smaller courts are infinitely varied in design, and are inscribed with the names of early patrons of the college. Through them fascinating glimpses of the courts beyond may be had.

The variety and appropriate form and character given to the fenestration, to each bay and gable, and the effective accentuation of sculpture and carving are worthy of remark. In the leaded windows the diamond panes add brilliance at the more important points; elsewhere the quieter square panes are relieved by eccentric departures from precise regularity. Here and there the flash of a Norman slab is seen, and the broken lines of supposititious repairs add the charm of age.

With the exception of the Wrexham Tower, which is modelled after the tower of St. Giles at Wrexham, Wales, the burial church of Elihu Yale, there is no single feature or group which is a conscious replica of any existing building. And still the charm of the Old English Colleges has been caught and fixed. The spirit of the chosen style has been so absorbed, and the manipulation of its characteristic features so perfected, that the requirements of modern construction, equipment, and plan have been clothed in the veritable atmosphere of ancient university buildings.

The delightful mellow effects of age have been sought and successfully reproduced. This has been done, not from the foolish but, unfortunately, very common standpoint that whatever is old is beautiful, but from a realization that age produces colors and textures of great beauty, and that the limitations of ancient handicraft contribute greatly to the undeniable charm of the antique. By analysis of these effects, by a clever choice of materials, and by the utilization of many results from modern mechanical tools and processes which are often overlooked and discarded, this charm has been reproduced with astonishing fidelity.

Thus it will be noted that the stones do not fit with obtrusive precision, their edges are not perfect, and their surfaces exhibit the marks of whatever tool would cut best that particular piece. Old bricks have been used, chosen for their size and color, and since old bricks must be cleaned, the sand-blast has been used, softening their surfaces and rounding their outlines. The violent colors of new pressed bricks have been reduced to mellow harmony by the same process, and in laying the bricks marked departures from the monotonous precision of so-called skilful bricklaying have purposely been made. A special roof tiling has been developed, the surface being combed or roughened in the moulds, to promote the retention of dust and the growth of moss, the edges chipped to irregular outlines, and the tiles finally glazed with various colors to harmonize with the walls, all with the intent to secure a certain effect unobtainable in natural slate or stone. It may be said that the roofs are expected to become appreciably softer and more uniform in color as time goes on, and that the selection of glazing colors has been made with this end in view. The roof tiles are thickest at the eaves, and become gradually thinner toward the ridges, and the exposure likewise diminishes in the same direction. The courses are continued through the valleys in gentle curves, and at the junctions of the roofs with gable copings the right angle has been softened by an upward curve of the roof. This device takes up the gradual falling away of the tiled surface from a line parallel to the coping, due to reduction in thickness, and results in the easement curves with which the ridges join the coping peaks. The metal work of the roofs, including gutters and leaders, is of copper, lead coated to secure harmony of color, and the leader heads are of different antique patterns.

At the centre of Branford Court the imposing outlines of Wrexham Tower, which have been glimpsed through the elms, are fully revealed. Upon nearer approach it will be seen that its base has been surrounded by a group of low buildings, so that its apparent distance from Branford Court is increased, and it asserts itself only as a crowning feature. Turn now and behold the majestic Harkness Tower in its best setting. Its nearer corner stands well within the court, permitting full realization of the strength of its lower shaft, whence it rises, ever lighter in form and color, more exuberant in line and ornament, until it terminates in a bewildering richness of tracery and pinnacles 216 feet above the ground. As it lifts itself above the roofs, note the restraint with which the solid wall is pierced by louvers, their tiled surfaces carrying the roof color up into the tower. See also the vigor with which the solid balconies below the louvers terminate the series of vertical openings above. The gallery of the belfry marks a binding horizontal line as the wall recedes and multiplication of vertical elements begins, accompanied by the first touches of ornament. Then the bel fry rises, still four-square, with great traceried lancet open ings, through which, at morning and noon, sunset and cur few, will soon come the mellow tones of chimes. Half-way up the belfry, upon the eight corner buttresses, are cano pied niches occupied by heroic effigies of Elihu Yale and the university's most eminent sons. They are, beginning at the southeast corner, facing High Street: Elihu Yale, Jonathan Edwards, Nathan Hale, Noah Webster, Fenimore Cooper, John C. Calhoun, Samuel F. B. Morse, and Eli Whitney. At about the same level there will later appear clock-dials in bronze tracery, applied over the architectural features. Higher up, on the mullions of the belfry openings, are smaller figures of Phidias, Homer, Aristotle, and Euclid, typifying the arts and sciences. Upon the finials of the tapering crocketed labels of the belfry openings the Yale bulldogs appear, sheltered below the cornice which marks the beginning of the lantern, and carries the traceried parapet of the lantern gallery.

HARKNESS TOWER

The ease with which the vertical members of the square belfry terminate and merge into the octagonal lantern is worthy of attention. The central buttresses bear free standing figures emblematic of Business, Law, Medicine, and Ministry, silhouetted against the lantern opening of each side. The corner buttresses diminish by successive gablets and weatherings, merge into the main corners of the tower, which are carried up from the base with certain diminishing transitions, and terminate in pinnacles forming the counterforts of flying buttresses leading gracefully upward to the crown. Engaged in the angles of the corner piers at the level of the lantern gallery are twelve figures, uniform in size with the four just mentioned, and representing Life, Progress, War, Death, Peace, Prosperity, Effort,

Order, Justice, Truth, Freedom, and Courage. On the eight intermediate buttresses which form the corners of the lantern, and near their top, are martial figures typical of our soldiers in the country's wars, from the Revolution to the World War. Just above these figures are gargoyles in the form of students, suggestive of various undergraduate activities, scholastic, literary, social, and athletic. Central between the gargoyles are masks of the classic poets, Virgil, Homer, Dante, Shakespeare. Above the lantern is the terminal stage, the crown, also octagonal, but presenting its angles in the centres of the eight sides below. By this adjustment there is secured a double crown of pinnacles of mysterious intricacy, the lower tier melting into the traceried parapet which unites the pinnacles of the upper crown.

Glancing again at the base of the tower, note the careful rendering in color, which, though common in pictorial architecture, has been accomplished here, perhaps for the first time, in stone. The largest, darkest, and roughest granite has been built into the base of the tower, and as the tower rises the colors become lighter and the texture smoother. Bits of the sandstone trimming stone begin to appear, and as still greater height is gained, the granite becomes less in area and still lighter in color until it vanishes altogether in the lantern, and the tower is completed entirely in the lightest golden sandstone. Note, also, the increasing tide of ornament and sculpture as the tower rises, every line of the bottom growing, budding, and blossoming as it ascends.

COLOR

Having traced this effective gradation of color and ornament in the tower, note the contrast in the color of adjacent buildings, and in the towers forming counterbalancing elements in the general group. In Wrexham Tower the colors of the granite have been restricted to grays of various tints, and the trimming stone is gray Indiana limestone. The same color has been used in the tower at the northeast angle of Branford Court. Whatever the weather conditions, Harkness Tower glows with warmth; the other towers remain subordinate in the color scheme.

Similar color contrasts may be noted in the northerly buildings of Branford Court, those units adjacent to the above-mentioned towers being limited to gray and the central building to half-gray. In the other sides of the court the full range of granite color is used, with Briar Hill sandstone trimmings, but the darkest obtainable granite is reserved for the base of Harkness Tower.

To this lightening in weight, color, and line, as the tower ascends may, perhaps, be attributed the impression which it creates of "leaping into the air," of having no ponderable weight upon the ground. Borrowing many of the features of its Gothic prototypes, it is unaffectedly modern in its sculpture and feeling, and forms a fitting and triumphant climax to the general composition.

The considerations which resulted in the location of the great Harkness Memorial Tower at the southeast angle are discussed elsewhere. Satisfactory balance of the group demanded the echoing of this dominant element with another tower of considerable size at the diagonally opposite angle, and such a tower found a place in the preliminary study. To Mr. Anson Phelps Stokes, then secretary of the university, who followed the inception and development of the design with the keenest interest and appreciation, is due the happy suggestion that there should be incorporated in the group a replica of the tower of St. Giles at Wrexham, Wales, within the shadow of which stands the tomb of Elihu Yale. The tower which early sketches of the Quadrangle show at the northwest angle of Branford Court was thereupon transformed into a replica of the Wrexham Tower. Over its doorway has been set a stone from the older Wrexham, presented by the vestry of St. Giles's Church to the university, thus visibly linking the old world with the new.

WREXHAM TOWER

Mr. J. Layng Mills, Yale '01, writes of this tower as follows: "Considered as architecture, the Wrexham Tower on the York Street side of the Memorial Quadrangle is an achievement in itself. Designed to give a strong accent to this façade and at the same time to give balance to the more lofty Harkness Tower in the general composition of the group, it accomplishes both of these purposes admirably —the more so because in opposing two vigorous silhouettes, one dominant and one subordinate, the continuity of the design of the entire group, the balance between the two sides of the square, and the scale of the whole has been preserved to a remarkable degree. . . . It is an essential part of the group to which it belongs, and this was not a task easy of accomplishment. Mr. Rogers has told me that he purposely avoided having any measured drawings made of St. Giles, or even any photographs in his office of size enough for the details to be distinguishable, while the designs of his tower were being made. This required real courage, and yet I cannot imagine any other way in which continuity of design and scale with his larger group could have been preserved."

The smaller courts toward Library Street have each a distinct individual character, due principally to differences in the materials and colors of their walls. They are named for the famous literary and debating societies which flourished at Yale in the early nineteenth century. In each court the south wall is only one story high, and the nearness of the long, sloping roofs to the eye brings the beauty of the tiles strongly into the picture. In Linonia Court, the one nearest to Harkness Tower, the walls are of mingled antique red brick and seam-faced granite. The bricks have been softened in texture and outline, and are laid with considerable irregularity. This court is entered directly from Library Street through Pierpont Gateway, whose ceiling vaults are also of antique red brick but of greater age, smaller in size, and more striking in color. These bricks were probably first used in the "Old Brick Row" which stood along College Street, facing the green. The present "Connecticut Hall," now surrounded by the modern buildings of the campus, is the only survivor of these early college buildings.

SMALLER COURTS

The central one of the southern courts, Calliope, is to be reached only from Branford Court through a double passage, vaulted with seam-faced granite, showing the full range of color afforded by this material. The bonding of the vault stones is extremely irregular. They are arranged primarily for color effect, shaded from dark tones at the spring to light tones in the crown. The plan of the passage is "warped" in true mediæval style, to accommodate the unbalanced relation of the two opposite entries. With equal freedom each of the central columns and their responds is of a different design, and the vault ribs are of a different profile in each bay. The walls of Calliope Court are of Boise stone in coursed ashlar. The surface presents an interesting irregular texture, resulting from sawing with shot and sand. Of a predominant light gray, the stone exhibits traces of a variety of warm, delicate colors. The southerly face of the battlemented square tower above the passage, with its adjoining stair turret, is reminiscent of Italian Gothic, yet without discord among its surroundings. The

(*Continued on page* 304.)

INTERIORS, STUDENTS' SUITES, HARKNESS QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.

(*Continued from page 302.*)

sculptured device above the double portal is that borne by the pendant upon the golden collar forming a part of the ceremonial regalia of the president of the university.

The last of these three courts, Brothers-in-Unity, may be reached from Library Street through Davenport Gateway, and from Branford Court through Eliot Gateway. Here the walls are of seven different sizes and five different colors of pressed brick, which have been brought to an agreeable soft color by sand-blast, and have also been treated for the removal of sharp edges and corners. They are laid in apparently haphazard fashion, as the various sizes may fit together with pieces of sandstone and limestone, taking up the bond at irregular intervals. In the upper part of the walls granite, carefully harmonized in color, is introduced. The seal of the society for which the court is named is placed in the low gable on the south side. The statue in the niche in the northwest angle is that of Noah Webster, author of the dictionary.

Opposite Eliot Gateway, on the north side of Branford Court, is the south portal of Dummer Gateway, which leads through Wrexham Court by a cloistered passage. Its north portal opens into Saybrook Court. The portals are vaulted and the intervening arcade of the cloister, which is early renaissance in character, supports an oak-timbered ceiling. The arcade and the trimming stone of Wrexham Court, as well as of Wrexham Tower, is gray Indiana limestone, and the granite walls are restricted to tones of gray. Over the entrance to Wrexham Tower, and suitably inscribed, is the stone sent from Wrexham Church. The outer face of the arcade is ornamented by sculptured symbolic heads, and in the angles at its ends are portrait busts.

Within the cloister, as terminals of the label mouldings of the late Tudor arches which open into the portals at either end, are playful humoresques carved in the form of bulldogs in varied guise. The pup with unruffled brow and wondering spectacled eyes represents the undergraduate. Beside him in football armor is the athlete, while on the opposite arch are the soldier and the graduate, the latter wise and important in cap and gown. Above each head is a sculptural key to the character typified below.

NORTHERN COURTS

In Saybrook Court an increase in severity and scale of detail commensurate with the size of the court may be observed. The materials are seam-faced granite, trimmed with gray limestone in the south wall and Briar Hill sandstone elsewhere. Lower units and flat roofs to the south are contrasted with the highest buildings of the group on the other sides. The court is shaded by the largest elm within the Quad. Around a smaller central tree is a circular stone bench, and another bench stands against the wall of a high terrace across the easterly end. An arch at the base of the terrace stair in the southeast angle unites the terrace wall with the wall of a projecting gable.

Wrexham Tower dominates this court and is echoed by other lesser turrets. Entrance from Elm Street is through Saltonstall Gateway, early renaissance in detail. An old millstone of historic interest forms a part of the path flagging in front of the terrace bench. This stone was first placed in the Lion Gardiner Mill, built on Saybrook Point in 1636. It was later transferred to another mill in the westerly part of the town. It was presented to the university by the selectmen of Saybrook, and removed to its present position in Saybrook Court in 1921.

Killingworth Court, in the northeast corner of the group, is similar to Saybrook Court in size and material, but different in general effect. A very low terrace wall divides it into two levels. The high screen wall on the south conceals the entrance to service-rooms below, and is continued into both southerly angles, unifying this elevation. On the easterly wall is a replica of the tombstone of Reverend Abraham Pierson, first rector of the college. Near the top of the stair tower in the northwest angle is a carved relief recalling the probable outlines of the parsonage which stood in that portion of the old town of Killingworth which is now the town of Clinton, where the Reverend Pierson gave the first instruction to students of the Collegiate School. Interesting grotesques crown the buttresses of the western wall, and high up in the southeast angle are the arms of John Davenport. In the pavement before Webster Entry is a millstone which was removed from a mill in Killingworth and replaced by a new stone when the mill was repaired to grind grain for the Continental Army of the Revolution. It was preserved at the ancestral Killingworth home of Everett E. Lord, who presented it to the university. Berkeley Gateway, the Elm Street entrance to this court, is early renaissance in style. In its vaulted ceiling worn red brick from a street pavement produces a surprising effect of antiquity and pleasant color.

PLANTING

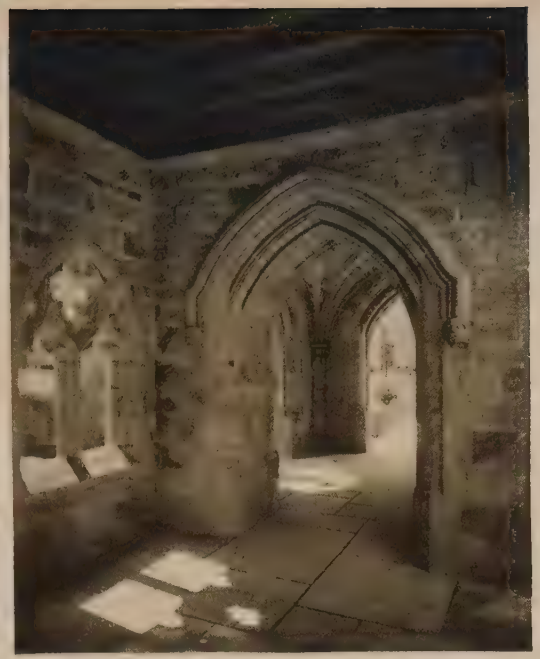
All trees favorably located upon the entire plot were carefully preserved. Old trees, from sixteen to thirty-six inches in diameter, which occupied the sites of new buildings, were moved to new positions within the courts. A few failures attended this operation, but the preservation of so large a number of venerable trees has brought to the Quadrangle the atmosphere and dignity of age usually unobtainable for many years. The planting of the moats and courts has been designed and executed by Mrs. Beatrix Jones Farrand. The limitations of practical use and care, and of city conditions, are severe in landscape work of this character. Time must elapse before the ultimate effect present in the designer's mind can be attained, but the immediate results in this case form pleasing and appropriate adjuncts to the architectural scheme.

INTERIORS

A typical suite of rooms consists of a study and two bedrooms, but this is varied as the plan permits by grouping a study with one or three bedrooms. Single rooms, combined study and bedroom for a single student, occur occasionally. The rooms are simple, strong, and notably masculine in character. Every study has a fireplace, its mantel and fittings varied in detail as becomes the scheme of the room. Some are faced with Tracon or Kasota stone, the American Travertines, and lined with brick and iron. Others are faced and lined with brown or green sandstone. The studies are wainscoted with oak to about 3½ feet in height, and generally the chimney breast is wainscoted to the ceiling. Wainscoting and other trim is of oak, stained to a light old brown in antique effect, all arrises and the projections of mouldings and carvings showing lighter, as if worn. The walls, above the wainscoting, and the ceilings, which are plastered directly upon the concrete floor construction, are of very rough texture, and are stained with Minwax in light browns and grays. The floors are of wide oak planks, showing the wrought nail-heads and the marks of the plane. The wall base throughout studies and bedrooms is of black slate.

The wainscots are of various patterns, some in old English panels, others chamfered boards, others of alternate boards and moulded battens. Some are applied with exposed wrought-iron nail-heads. The woodwork is liberally embellished with carving, in which the sculptor has been permitted the free exercise of his imagination. The designs

(*Continued on page 306.*)



CLOISTERED PASSAGE, DUMMER GATEWAY.

DAVENPORT GATEWAY.

PIERPONT GATEWAY.

SALTONSTALL GATEWAY.

BERKELEY GATEWAY.

MATHER GATEWAY.

GATEWAYS, HARKNESS QUADRANGLE, YALE UNIVERSITY, NEW HAVEN, CONN.

(*Continued from page* 304.)

are ingeniously varied in the mediæval spirit, so that no duplication occurs in similar features. No study is without one or more generous window-seats, beneath which the radiators are mounted on a slate platform. The windows are set into the stone jambs and mullions and are without wood trim. All windows are iron casements swinging out, and the leaded panes bear an occasional grotesque or humorous picture, or the device of some old eating club or society. These window decorations, which are painted and fired into the glass, are drawn from old college publications, and record old Yale history and traditions, as well as contribute a quaint decorative character.

The numerous changes in plan, produced by the variations in the exterior architecture, combined with the changes in trim detail, produce an infinite variety of interiors, so that apparently there are no two rooms exactly alike. Conditions for which the woodwork has of necessity been specially designed frequently occur, and are utilized to obtain still further departures from typical effects. Their general character is such that age and use will improve, not mar, these rooms.

The bedrooms are as simple as possible, the woodwork being restricted to doors and to base and picture mouldings. The walls and ceilings are painted rough plaster. The floors are of narrow oak. Closets have cement floors flush with the top of the slate base, and are provided for all bedrooms.

In addition to the studies and bedrooms, four general meeting-rooms have been provided, to be known as Commons. These rooms have been designed in different quaint fashions, after old English precedents, and are named for old buildings which have been removed from the campus. They will be known as Athenæum, Cabinet, Lyceum, and Trumbull. Historic subjects are introduced throughout their design, and they are expected to develop new and beneficial elements in Yale undergraduate life.

The preliminary model and sketches were accepted in March, 1917, and the corner-stone was laid on October 7 of the same year, this being the two hundredth anniversary of the raising of the frame of the first college building in New Haven. The professional mind will appreciate what a task was accomplished by the architect in these seven months. Full-size profiles of belts from water-table to cornice, the sizes of buttresses, and the details of windows had to be determined and fixed immediately for the entire group, in order that foundation plans could be figured and stone cut for the lower courses. But it was accomplished, and only two changes were afterward made in constructed foundations.

CONSTRUCTION

Demolition of the extensive buildings on the site began July 20, 1917, excavation started September 22, and foundations were begun September 29, 1917. With the active entrance of the country into the war, construction was restricted, and finally ceased when protection had been afforded to the partially completed work. It was resumed June 6, 1919, and in less than sixteen months, starting from the first-floor level, the buildings south of Branford Court were completed and turned over to the senior class for occupancy on September 22, 1920. Between this date and June 18, 1921, the entire group of buildings and towers was finished, with the exception of the interior of the four Commons rooms and of the memorial rooms in the Harkness Tower, making it possible for the university to entertain in the Quadrangle rooms the official delegates to the inauguration of President Angell. The practical completion, above the first-floor level, of a structure of this size and of such unusual character in two years, is an accomplishment upon which builder and architect may be congratulated.

Already many competent critics have expressed enthusiastic appreciation. The students, including the seniors of 1921 who occupied the buildings south of Branford Court last year, are unanimous in their approval. But it is particularly gratifying to observe how strongly the Quadrangle appeals to the general public, who visit it in daily increasing numbers from all parts of this country and from foreign lands. Those who heard the tremendous applause which greeted the architect upon the receipt of an honorary degree at the Yale Commencement last June could not but be thrilled by this spontaneous and enthusiastic public tribute to architectural achievement.

PUBLIC APPROVAL

The Quadrangle has quickly taken its place in the affections of New Haven's people. It is already a cherished feature in the city's life. "The buildings stand, in the midst of traffic, a monument to the life of beauty, to the life of the spirit," writes Professor William Lyon Phelps, who gracefully expresses the common tribute of admiration when he says: "For my part, the Memorial Quadrangle gives me actual happiness every day of my life; for a thousand years to come it will educate, inspire, and civilize those who live within its enclosure and those who come to see it; century after century people will come from all over America to gaze at its mysterious and inspiring towers and walls, and no intelligent European will return from an American sojourn without having visited Yale. It is a joy and delight to me, a devout worshipper of beauty, to know that long after my bones are dust, long after I have left this planet, these gracious and lovely buildings will cast their charm over the coming children of men."

THE NAMES OF THE COURTS

BRANFORD. Named from the town near New Haven where ten ministers of the Colony met in 1701 to found the College.

SAYBROOK. The town where the Trustees organized in 1701, and where the college was first officially located and the first commencement exercises held.

KILLINGWORTH. The place of residence of the first Rector of the College, Reverend Abraham Pierson, in whose house the first students lived and received instruction.

WREXHAM. The forecourt of Wrexham Tower, so named from the town in Wales where stands the tower of St. Giles's Church, of which this tower is a modified copy. Near St. Giles's Church is the tomb of Elihu Yale.

LINONIA, CALLIOPE, and BROTHERS-IN-UNITY. Names given in honor of the three historic debating societies at Yale, whose best days are said to have been from 1800 to 1830.

THE NAMES OF THE GATEWAYS

No. 1. MEMORIAL GATEWAY. The principal entrance opposite the Campus and adjoining the Harkness Memorial Tower.

No. 2. PIERPONT. James Pierpont, pastor of the New Haven Church, 1685–1714; the college charter was secured chiefly through his leadership in 1701.

No. 3. LIVINGSTON. Colonel Philip Livingston, of Livingston Manor, New York, who had had four sons graduated here, made a gift of money in 1745, which was appropriated to the endowment of the earliest Professorship at Yale, that of Divinity.

No. 5. DAVENPORT. John Davenport, founder of New Haven in 1638; moved as early as 1648 for having a college here, which largely influenced the settlement of the Collegiate School in New Haven in 1716–17.

No. 6. ELIOT. Jared Eliot, of Killingworth, who was a graduate of the Class of 1706 and a Trustee from 1730–63, and by a bequest established the first permanent fund for the benefit of the Library.

No. 7. MATHER. Cotton Mather, of Boston. His letter to Elihu Yale in January, 1718, secured Yale's interest in the College, and suggested its being named for him.

No. 8. DUMMER. Jeremy Dummer, the Colony Agent in London, who interested Governor Yale in the College and collected large gifts for the Library.

No. 9. FITCH. James Fitch, of Plainfield, who, in October, 1701, made a generous offer of land and materials for the original buildings of Yale College.

No. 10. SALTONSTALL. Gurdon Saltonstall, Governor of Connecticut, was the agent chiefly prominent in fixing the College in New Haven in 1716–19.

No. 11. BERKELEY. George Berkeley, Dean of Derry and Bishop of Cloyne, in Ireland, gave his estate at Whitehall, near Newport, Rhode Island, as a foundation for graduate scholarships and undergraduate prizes, also nearly 1,000 books for the college library, in 1731–33.

THE NAMES OF THE ENTRIES

NUMBER	NAME	GRADUATE	CLASS	ACHIEVEMENT
1	BUSHNELL	David Bushnell	1775	Inventor of Torpedo and "Father of Submarine Warfare."
		Horace Bushnell	1827	Theologian and Preacher.
2	CALHOUN	John Caldwell Calhoun	1804	Vice-President of the United States.
3	COOPER	James Fenimore Cooper	1806	Novelist.
4	CUTLER	Manasseh Cutler	1765	One of the Authors of the Ordinance of 1787, Botanist, etc.
5	DANA	James Dwight Dana	1833	Geologist and Mineralogist.
6	DICKINSON	Jonathan Dickinson	1706	First President of Princeton College.
7	DWIGHT	Timothy Dwight	1769	President of Yale College.
		Timothy Dwight	1849	President of Yale College.
8	EDWARDS	Jonathan Edwards	1720	Theologian and Metaphysician.
9	EVARTS	William Maxwell Evarts	1837	Leader of the American Bar and Secretary of State.
10	GALLAUDET	Thomas Hopkins Gallaudet	1805	Founder of Deaf-Mute Instruction in America.
11	GIBBS	Josiah Willard Gibbs	1858	Discoverer and Interpreter of the Laws of Chemical Equilibrium.
12	GILMAN	Daniel Coit Gilman	1852	First President of Johns-Hopkins University.
13	HALE	Nathan Hale	1773	Patriot Spy of the Revolution.
14	HUMPHREYS	David Humphreys	1771	Washington's Aide, Diplomat, and Man of Letters.
15	JOHNSON	Samuel Johnson	1714	First President of King's, now Columbia, College.
		William Samuel Johnson	1744	One of the Framers of the United States Constitution and President Columbia College.
16	KENT	James Kent	1781	Author of Kent's "Commentaries on American Law."
17	KING	Clarence King	1862	Founder of the United States Geological Survey.
18	LOOMIS	Elias Loomis	1830	Authority on Meteorology.
19	MASON	Jeremiah Mason	1788	Leader of the New England Bar.
20	MITCHELL	Donald Grant Mitchell	1841	Author.
21	MORSE	Samuel Finley Breese Morse	1810	Inventor of the Electric Telegraph and Artist.
22	SEABURY	Samuel Seabury	1748	First Bishop of the American Episcopal Church.
23	SILL	Edward Rowland Sill	1861	Poet.
24	SILLIMAN	Benjamin Silliman	1796	Pioneer in Scientific Education.
25	STILES	Ezra Stiles	1746	Antiquarian, Scholar, and President of Yale College.
26	SUMNER	William Graham Sumner	1863	Sociologist and Economist.
27	SWIFT	Zephaniah Swift	1778	Chief Justice of Connecticut and Author of "Swift's Digest."
28	TAFT	Alphonso Taft	1833	Attorney-General and Secretary of War.
		William H. Taft	1878	President of the United States.
29	TILDEN	Samuel Jones Tilden	1837	Governor of New York and Democratic Candidate for Presidency.
30	WAITE	Morrison Remick Waite	1837	Chief Justice of the United States.
31	WEBSTER	Noah Webster	1778	Lexicographer.
32	WHITE	Andrew Dickson White	1853	First President of Cornell University.
33	WHITNEY	Eli Whitney	1792	Inventor of the Cotton Gin.
		Josiah Dwight Whitney	1839	Geologist.
34	WILLIS	Nathaniel Parker Willis	1827	Poet and Man of Letters.
35	WINTHROP	Theodore Winthrop	1848	Patriot and Author.
36	WOLCOTT	Oliver Wolcott	1747	Signer of the Declaration of Independence.
		Oliver Wolcott	1778	Secretary of the Treasury under Washington.
37	WOOLSEY	Theodore Dwight Woolsey	1820	President of Yale College and Eminent Scholar.

Carved band in Davenport Gateway.

A General Survey of the Mechanical Equipment
of the Harkness Memorial Quadrangle

By Cornelius J. Davis
Engineer in Control of Heating, Plumbing, and Electricity

THE mechanical equipment at the Quadrangle is controlled in the pump and service rooms.

Due to the architectural treatment of the buildings and its many passages, it was necessary to run the mains through three tunnels radiating from the pump-room, and rising at four points to the basement ceilings, there distributing to the various buildings.

This divided the group into four units, and the valving is so arranged that it is possible to control independently any unit, building, section, or riser.

Details of the three types of toilet-rooms and the numerous combinations of fitting that might be used by the plumber or steam-fitter were carefully worked out in advance, so that it was possible to complete the concrete floor slabs with the necessary holes in same in advance of the roughing in.

The combination of slop-sink closet, shower and water-closet stalls were so designed as to eliminate all unnecessary exposed metal in their construction. Wall-hung water-closet and lavatories were installed. All exposed metal, including faucets, shower-head accessories, electric-switch plates, and hardware in all toilet-rooms are "Benedict Nickel," except piping under the lavatories, which is "Saxo White" finish.

No bathtubs are used in any of the buildings.

Brass pipe is used throughout for the water system, and the hot-water storage-tanks are solid-copper shells. Gravity-circulating hot-water system is installed with auxiliary circulating pumps to start circulation in the morning.

Two six-inch connections are made to the street water-mains—one in Library Street and the other in High Street—to insure a continuous supply of water to the Quadrangle. The street supplies connect with the suction-tank, and from there the water is pumped into the two house tanks, one located in the Harkness Tower and the other in the Wrexham Tower. The down supply from each tank is cross-connected in the basements with a distributing main that circles the group. Concealed flush valves are used with a special three-inch push-button set in the wall behind the water-closets. A gentle push with the shoulder will flush the closet.

Slow-closing faucets are used on all lavatories to save wasting of water, the flow being regulated so that it is possible to wash your hands under running water. The cold-water faucet flows about four times as long as the hot when released.

Under basement floors extra-heavy cast-iron pipe was used. The court drainage system is constructed of extra-heavy cast iron to prevent the roots of the trees filling the pipe in a few years, as is the case when tile pipe is used.

The low-pressure vacuum steam-heating system, in addition to the general scheme of control hereinbefore described, is divided into three systems, known as regular, secondary, and special.

The regular system controls one radiator in each study, bedroom, and upper stair halls; the secondary system controls one radiator in each study; and the special system controls toilet-rooms and first-story stair halls, so that it is possible for the engineer to regulate the amount of heat in each suite according to season of the year.

The steam for heating the buildings and the hot water in the storage-tanks is supplied through one fourteen-inch low-pressure and one ten-inch high-pressure main from the university's power-house.

Ventilation in the toilet-rooms is accomplished by louvers in the sill of the metal window-frames and a vent shaft heated by the hot-water risers located near slop-sink closet.

All windows have louvers and each study a fireplace, which creates a natural ventilation. Where it was not possible to have a fireplace in a study or single room, a vent register was installed.

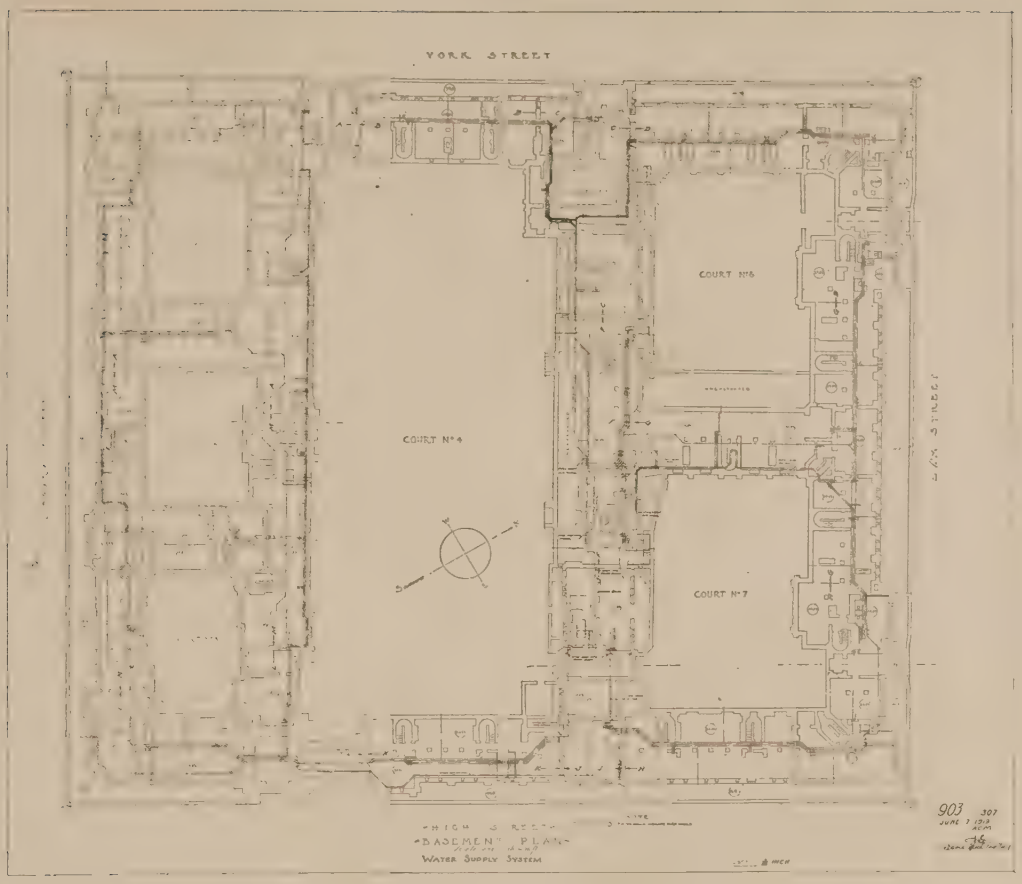
The electric lights and power of the Quadrangle are controlled from the main switchboard located in the service-room, with one or more panels in each building, according to the size. (I might mention here that during construction the Quadrangle was divided into eleven buildings.) Each panel is divided into three parts or systems, designated as "A," "B," and "General," which also includes "D" circuits.

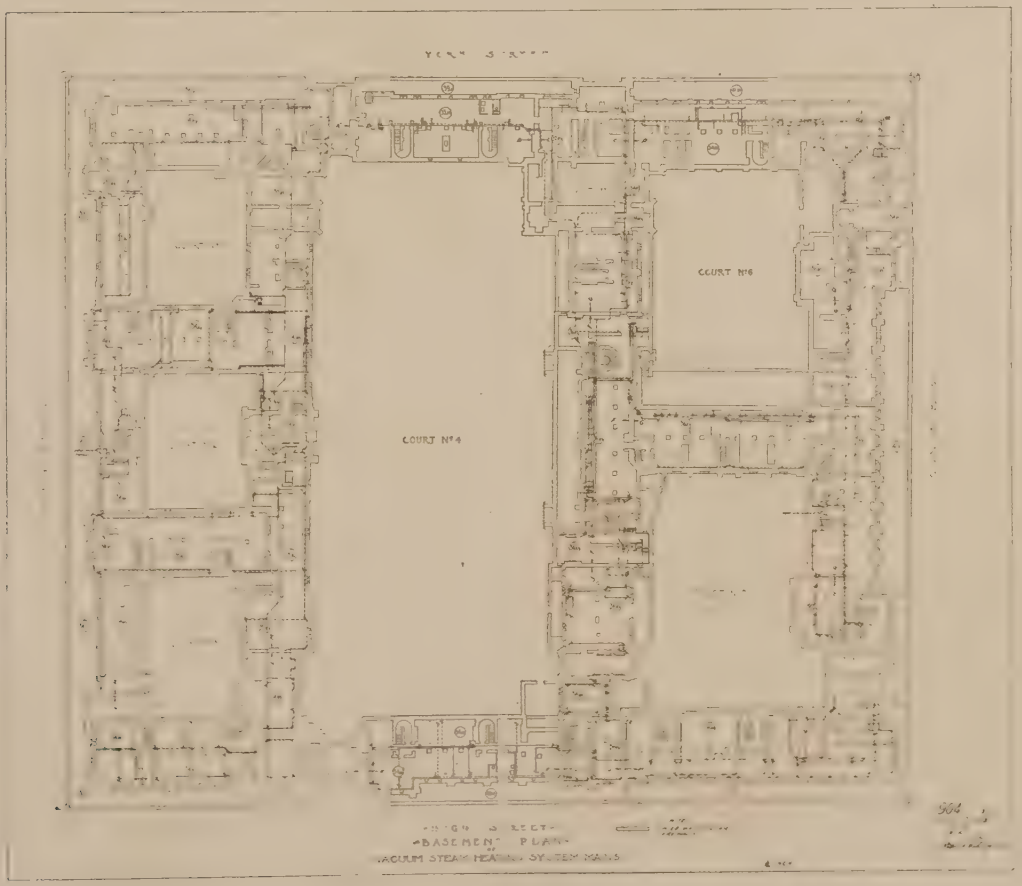
The "General" system controls the branch circuits feeding the fixtures and receptacles in each suite. The "D" circuits control those lights that burn continually in stair halls and corridors. The "A" system controls lights in stair halls and one ceiling light in toilet-rooms that burn from sundown to sunrise. The "B" system controls brackets and one ceiling light in toilet-rooms that burn until 10 P. M. The exterior lighting of the Quadrangle and lights over entries are divided into two groups, each controlled by a time switch. One set of power feeder consisting of two five-hundred-thousand circular mils and two lighting feeders each consisting of two one-million and one five-hundred-thousand circular mils cables, supply current to the Quadrangle.

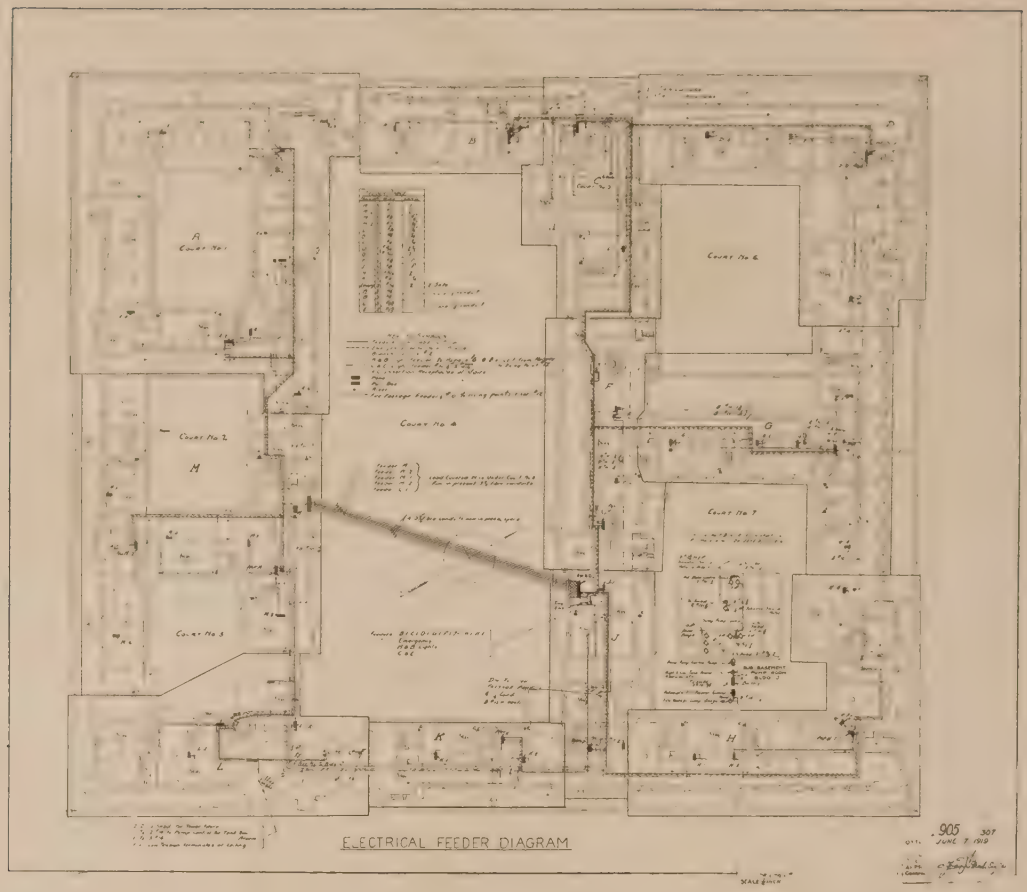
Each set of lighting feeders carry one-half of the load with the "A" and "B" systems cross-connected on the main switchboard, so that all toilet-rooms, stair halls, and corridors can be fed by either set of mains.

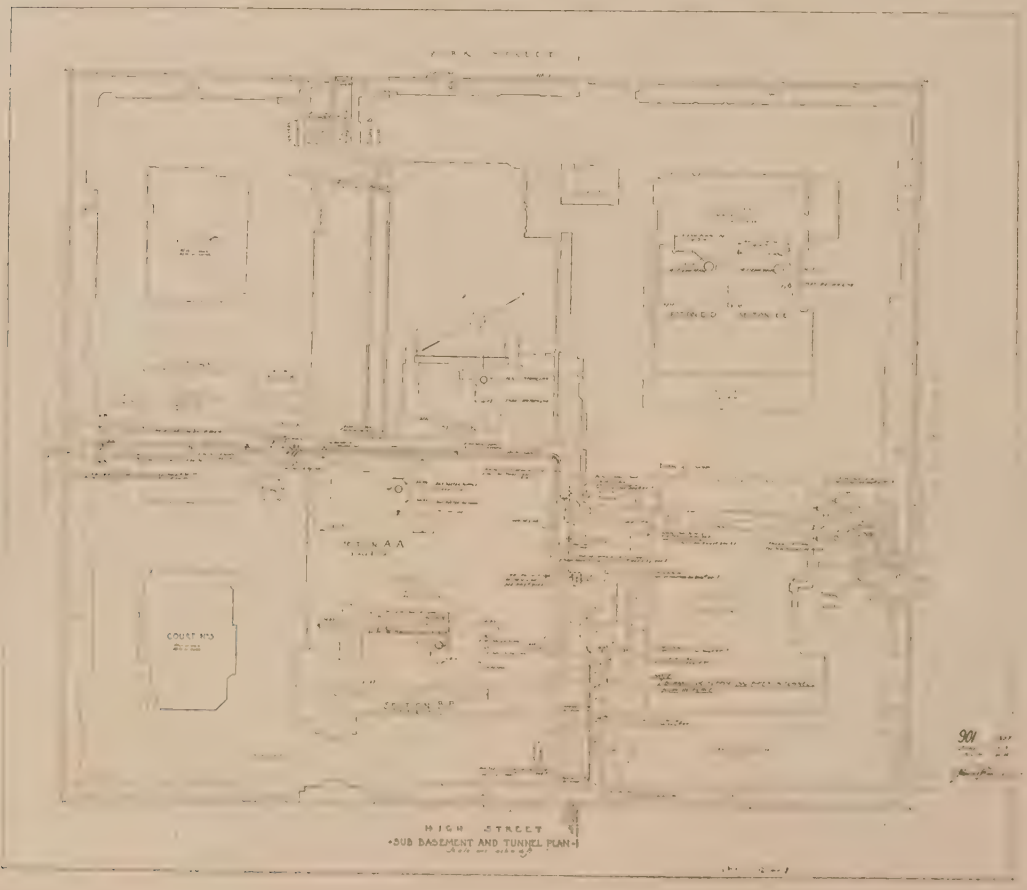
Every panel in the group is equipped with an emergency feeder.

The Quadrangle has a number of fire passages, and the lighting of them is so controlled that if a door to any fire passage is opened it throws in a remote control switch located in the service-room, which in turn lights the fixtures in that particular passage, closes the circuit in annunciator which indicates the number of the fire passage, and sounds an alarm. The continual opening and closing of the doors in the passage after the circuits have once been closed does not affect the lights until the switch is reset by the engineer.


YORK STREET
COURT N°6
COURT N°4
COURT N°7
BASEMENT PLAN
WATER SUPPLY SYSTEM


COURT N°6
COURT N°4
BASEMENT PLAN


ELECTRICAL FEEDER DIAGRAM
905
JUNE 7 1919


HIGH STREET
SUB BASEMENT AND TUNNEL PLAN-1
901

Structural Features

By Adolph F. Bernhard
Engineer in Control of Construction

CONCRETE pier foundations extending to bed-rock under the Harkness Tower, specially treated adjoining foundations, large pipe tunnels under the basement-floor levels, cantilever stone stairs, intricate steel-framed pitched roof and reinforced hollow-backed gypsum roof blocks are the principal structural features of the beautiful group of dormitory buildings forming the Memorial Quadrangle at Yale University at New Haven.

The underlying soil consists of sand and gravel extending thirty or more feet below grade. A great deal of this excavated material was used in mixing with mortar and concrete. Seepage or ground water was not encountered except under the pump-room, a space some eleven feet below the floor level of pipe tunnels which lead to and from this point under the courts and crossing the buildings, finally extending also under three of the four streets surrounding the Quadrangle. The tunnels for pipe mains for heating, electricity, and some plumbing are about eight feet wide and seven feet high, built of reinforced-concrete walls and roofs, having a number of manholes opening to courts and basements for inserting additional piping and other manholes for ventilation. They contain the main steam-piping supplying heat from the main power-plant several blocks away, not only to this group of buildings but to others belonging to the university in adjoining blocks. Main hot-water supply-pipes are also run in these tunnels from the pump-room to various points in this group, and numerous electric mains in fibre conduits encased in concrete extend along, but outside of the tunnels are provided with separate manholes.

All the buildings have spread foundations built of concrete usually with two, three, or four stepped courses, which were reinforced with steel bars under heavily loaded points. The sizes of all footings were carefully calculated so that the bearing on the soil is equal on each square foot. Considering the different levels, such as at tunnels, at which these foundations had to be laid, and considering also the various heights of adjoining buildings and towers, the results have been most satisfactory.

The Harkness, or main, Tower, two hundred and sixteen feet high above grade, is supported on round concrete piers at the corners extending to bed-rock found about ninety feet below grade. These piers were sunk by the pneumatic-caisson process and were topped off under the basement floor with a concrete mat five feet thick reinforced in all directions with steel bars and which extends to the outer line of the tower buttresses. As one side of the arched Memorial Gateway was to be supported on this outer foundation, it was deemed advisable to support the other side on similar but not so deep supports. Concrete piles were designed for this, connected at the top with the above-mentioned heavy mat by means of reinforced-concrete beams. Other adjoining footings were loaded down before the foundation walls were built on them, to avoid possible future settlement, which method has proved efficient and wise, as no defects from this possible cause have become apparent.

One interesting method preventing cracks between the Harkness Tower and the adjoining buildings was used that is the reverse of the usual practice. To prevent unequal settlement caused by the compression of soil under the foundations, the foundation of buildings next to the tower were laid in the fall and loaded with an excessive load of pig iron and allowed to stand thus all winter in order that the soil would be as non-compressible as the stones under the tower.

Evidently this operation was successful, as so far no cracks after two winters have appeared.

The outside walls of all buildings below grade were built of rubble-stone, while the inside walls and piers are of brick. Above grade the walls are of brick faced outside with granite or stone ashlar and treated inside with a damp-proof compound before being furred with hollow terra-cotta blocks. All columns and the construction of all floors and flat roofs are built of reinforced-stone concrete, including beams, girders, and lintels over openings in walls. Terra-cotta blocks are used for all partitions, and solid brick walls at frequent intervals divide the interior into smaller units for additional fire protection. All window frames and sash in masonry walls above the basement are of iron cast in one piece.

In order to carry out the architectural tapering design of the towers, heavy reinforced-concrete girders were formed around them at the floors and united with the beams and slabs in the floors to form proper supports for the offsetting walls. Substantial anchors were also used to secure the walls above and below these points. A trestlework of steel beams is used to support the chime of ten bells that will be installed in the belfry portion of the main tower. Two of the towers contain large steel water-tanks placed at the same elevation and which are cross-connected in the basement.

There are thirty-nine sets of stairs distributed in the buildings, varying in height from one to eight flights. They are all built of solid American travertine stone and have continuous bevelled soffits. Most of these stairs have their steps built into the wall at one end only, on the cantilever principle, the other end being free and supporting a wrought-iron balustrade and wood hand-rail. All stair halls are lined with warm-colored rough-face brick and their floors are paved with darker brick. All living-rooms have oak floors laid on damp-proofed sleepers. Toilet-rooms have tile floors.

Stair hall in Cooper Entry.

Numerous stone bay windows used for architectural effect throughout the buildings presented many difficulties in designing their supports and anchorages. Generally they are provided with steel supports concealed in their bottom corbels and fitted with various

cantilever devices connected or built in with the main walls and floor construction. At the upper levels the floor construction usually extends out sufficiently to support the bays.

The pitched roofs covering most of the buildings, together with the smaller dormers, are constructed of steel framing, all riveted and bolted and securely anchored to the masonry walls and concrete floors. This framing is spaced up to seven feet apart, and is spanned with reinforced hollow-backed gypsum roof blocks eighteen inches wide. These blocks were made specially for this work of dense gypsum to insure the holding power of nails driven into them. The blocks were five inches high and had a minimum thickness of three and one-half inches. Each block was secured to the steel framing and all joints were pointed full with gypsum. In specially complicated places the gypsum was cast in place on temporary wood forms. Steel collar beams were used in these roofs to brace the rafters and to form the flat portion of metal furred and plastered ceilings in the upper rooms. These roofs were covered with a heavy ply of asphalt felt and then finished with specially made terra-cotta shingle tile of various colors, chipped on all exposed edges and varying in size and thickness. The tile were secured to the gypsum blocks beneath with copper-wire nails. The varying architectural designs of these roofs presented many difficulties in designing and detailing of the steel framing, as in scarcely any place were the members on both sides of the same roof opposite each other or symmetrical. Other difficulties to overcome were various locations of chimneys and of interior supports, besides the limitation of spacing for gypsum blocks. The steel was so carefully detailed, however, that the work of erection proceeded with hardly any refitting.

The Builder's Concept of the Construction of the Memorial Quadrangle and Harkness Tower at Yale University

RUSKIN has stated that no good work can be perfect and that the demand for perfection is always the sign of a misunderstanding of the ends of art. For since the architect, whom we would assume capable of executing his work perfectly, cannot do so with his own hands, he must either make slaves of his workmen, in the old Greek fashion, levelling his work to the workmen's capability and thereby degrading it, or he must take his men as he finds them, letting them demonstrate their weakness as well as their strength. This will result in Gothic imperfection but render the whole as noble as the intellect of the age can make it, paradoxical though that may seem.

Fundamentally, this principle was the key-note of the sympathetic understanding between the architect, the builder, and the artisans which has been expressed in the edifices forming the group of buildings known as the Memorial Quadrangle and Harkness Tower. The creative handiwork of the craftsman and mechanic is in evidence throughout the constructive and decorative treatment of the buildings. In fact, the true spirit of the old Gothic builders dominated everything.

The chronological record of the progress on the work indicates that the demolishing of the former buildings on the site (namely, Pierson Hall, Peabody Museum, Herrick Hall, otherwise known as the old "Gym," and others) was started July 20, 1917, the actual excavation was begun September 22, the foundation started September 29, and the corner-stone, at Building M, laid October 8, 1917, at Library and High Streets.

When America became actively engaged in war, the donor, feeling that it was unpatriotic to use men on this work when they were so urgently needed by the country, directed that the operation cease. It was not resumed until June 6, 1919, but by September 22, 1920, the whole unit facing Library Street was turned over to the university.

For two successive winters, 1918–19 and 1919–20, we were engaged on exterior masonry, such as pouring reinforced stone concrete floor slabs, beams and columns, building walls, setting roofs, etc., and to suit the variable weather organized a gang of 65 masons and tenders so as to work them outdoors when the weather permitted, and indoors when it did not permit. All of our concrete and mortar were machine-mixed outdoors, and each machine was equipped with a heater. We never lost any material through freezing, for we covered all work with tarpaulins, erected temporary doors with muslin window-enclosures, and turned on steam underneath. The winter of 1919–20 was the severest in the recollection of any living resident—severe cold and an unusual amount of snow. None of our help lost one minute from these causes. At times such material as was hauled was done by four-horse teams, due to snow in the streets. About 30,000 feet of cut-stone trim was hauled from New York on motor-trucks during this period. We had an emergency gang, whose job it was to report at 6 A. M. if snow fell overnight, or on Saturdays and Sundays to remove same from scaffolds and sidewalks. On one Sunday we had ten double trucks hauling snow from the premises. At the time of the Junior Prom the university was swamped, and called on us to remove snow from in front of Woolsey Hall, where the Prom was held. (We had ten 3-ton trucks on this work for ten hours.)

SPEEDING UP THE WORK IN WINTER

One of the great problems in a building operation of such magnitude was the inspection and supplying of materials in the quantities and sequence that should meet the schedule planned by the field superintendent, in order to minimize the loss of time and expense as far as possible.

As most of the material for these particular buildings was of a special design and manufactured all over the United States, some coming from as far south as Alabama, as far west as Boise City, Idaho, and as far east as New Hampshire, the transportation item became a very serious problem. We all know what a chaotic condition the railroads of the country were in, and especially during the years 1918, 1919, and part of 1920. The lack of rolling-stock, poor equipment, together with the many strikes in freight terminals and lighterage departments, made the period one of the greatest difficulties.

TRANSPORTATION WAS A DIFFICULT PROBLEM

The freight departments of the different railroads issued embargoes against one another and to connecting lines on their own railroad, on account of the accumulation of freight and the congestion which occurs at all freight terminals and junction points. This necessitated obtaining permits to ship to any point in the country, and was especially strict for all New England points on account of the poor facilities.

These embargoes made it necessary not only for us to act as traffic-manager for our own material but also for each and every subcontractor, and in many cases for plants which were fabricating material for our subcontractors.

To obtain these permits we had (in a great many cases) to secure them from at least two railroads on account of material either being fabricated on or routed over one or the other roads.

We also had to obtain permits in many instances for the shipment of the basic material from plants under contract with our subcontractors in order that we could obtain the finished product on time.

These permits were issued to us calling for from 1 to 15 cars, and in several cases permits were obtained for full train-loads of 50 cars.

When a permit was sent to a plant it again necessitated us sending a man to that territory in order to get the allotment of cars allocated by permit, and the loading of same before the expiration of said permit, which in most cases was only good for one week. We would ride the cars through keeping in touch with the train at all junction points so that it would not be split up and cars set off on account of the different classification orders issued at the various freight terminals. This meant a man on the road night and day, and, in many instances when breakdowns would occur to cars, following them on to the repair track or shop, and staying with such cars until they were repaired and moving again.

SOME STATISTICS

Statistics are tiresome, but it may interest the reader to know that in these buildings there have been utilized almost 7,000,000 common brick, including those from the demolition of old buildings that lend so much richness of color and flavor of antiquity where they have been used, 635,000 face brick, 170,000 square feet of stone ashlar, 41,000 barrels of cement, 350,000 square feet of partition, 125,000 cubic feet of cut stone, 57,000 square feet of cement paving in the basement, 26 miles of electric conduit, and 70 miles of electrical wire. There are 63,000 feet of steam-pipe, 1,650 radiators, 31,000 square feet of radiation, 3,500 valves, 33,000 feet of brass pipe for hot and cold water, over 3,700 windows, some 60,000 panes of glass.

The varieties of stone used in the Quadrangle will at least give some idea of the forethought and care devoted to these details. There was no haphazard selection, but every kind of stone—in fact, almost every individual bit of stone—was selected with the thought of its relation to the completed wall, vault, or archway in which it was to take its ordered place.

Exterior Trim: 85,000 cubic feet of Briar Hill sandstone from Glenmont, Ohio. 15,000 cubic feet of variegated limestone from the quarries in Bedford, Ind. 2,500 cubic feet of Boise stone from quarries at Boise City, Idaho. 500 cubic feet of Kingwood sandstone from quarries at Kingwood, Va. *Interior:* Approximately 190 shower-stalls and toilets, all of French-gray Missouri marble from Carthage, Mo. *Mantel Facings:* Approximately 305 made of the following: Tracon stone from Winona, Minn., Kingwood stone from Kingwood, Va., Kasota stone from Minn., Dorchester stone from Dorchester, Nova Scotia, Connecticut, brownstone from Portland, Conn. In each of 1,350 rooms, spaces, and showers, slate bases from Pen Argyl were used. *Memorial Room:* Approximately 3,000 square feet of Kato stone for the walls and fan vault in ceiling. *Interior Stair:* Approximately 14,000 cubic feet of Tracon stone from Winona, Minn., in 39 stairways. *Field Work:* Approximately 150,000 square feet of Plymouth Seam-Face granite from Weymouth, Mass. Steps to exterior doors of Stony Creek granite from quarries at Stony Creek, Conn.

Mr. F. S. Sutton himself, an expert stonecutter associated with the work and familiar with Old World traditions, and with the fascinating story of the master craftsmen of the great Gothic periods, emphasizes the fact that in all the work of the Quadrangle where intricate and delicate stonecutting was to be done, not only the hand of an expert was required but as well a mind that found inspiration and pleasure in the work. All of the stonecutters associated with the Quadrangle were men chosen for their special skill, and the spirit and atmosphere in which they worked was that of the days long before the age of machinery and mechanical cutting of ornamental stone. Mr. Sutton says that the moral effect upon the men working upon the Quadrangle was inspiring and uplifting. There was a unity of interest and a pride in the perfection of each man's work rarely shown in these modern days. He expresses his own pride in being connected with what he speaks of as "an unequalled example of Gothic building."

Announcements

A RIVAL OF THE BUSH BUILDING.—The new Wrigley office-building in Chicago is a veritable jewel at night that stands out against the dark sky like a sentinel clothed in snow-white, guarding all approaches to the city. The entire front of the building and four sides of the tower are flood-lighted with twenty million candle-power supplied by batteries of powerful X-ray reflectors.

George Feltham, architect of St. Petersburg, Florida, has opened a branch office in Clearwater, Florida, and requests samples, catalogues, etc., for his files.

Geo. W. Packer, Jr., architectural engineer, announces that he has established offices at 15 West 10th Street, Kansas City, Mo. He will continue the practice of architecture and architectural engineering, after years of service with the National Engineering Service Corporation of Illinois, and the Kansas City Southern Railway Company in their general offices, Kansas City, Mo. Catalogues requested.

The H. H. Winner Company, bank architects and engineers, announce the removal of their offices to more commodious quarters, second floor Cunard Building, 503 Market Street, San Francisco.

Frank H. Quinby, architect, announces that he has moved into new offices at 110 William Street, New York City.

The offices of Walter Thomas Williams, architect, have been removed from 151 Fifth Avenue to 41 East 42d Street, New York City.

Hamilton Harlow wishes to announce his withdrawal from the firm of Dow, Harlow & Kimball, architects and engineers. He will continue the practice of architecture under the name of Hamilton Harlow, Architect, with offices at 1388 Massachusetts Avenue, Harvard Square, Cambridge, Mass. Manufacturers' samples and catalogues are desired.

AVON, CONN.

PROVIDENCE, R. I.

RINGE, N. H.

BEDFORD, MASS.

LEXINGTON, MASS.

CONCORD, N. H.

A GROUP OF OLD NEW ENGLAND CHURCHES.

Architectural Design by the Use of a Module

By Ernest Flagg

Author of "Small Houses—Their Economic Design and Construction"

ARCHITECTURAL design by the use of a module, or fixed unit of measure, requires a peculiar habit of mind not fostered by common methods of teaching. It is a habit that can only be acquired by practice of a kind which few architects have had. The composer of music or poetry works to a measure to obtain harmony, and there can be little doubt that measure is necessary in architecture if the highest results are to be attained. Is not proportion in architecture harmony of dimensions, and how can one be sure of obtaining harmony of that sort without a scale to work by? In the highest type of architecture which the world has ever known the fixed unit governed. That Grecian Doric temples were designed to a module, and that that module was the spacing of the triglyph, the buildings themselves prove. For more than two thousand years design by this method has been practically a lost art. It is an art which should be revived, and a study worthy of the most profound consideration, but upon which the schools are silent.

Laying out the work on the ground.

It is almost universally admitted that certain combinations of dimensions produce pleasing results, but since the time of the ancient Greeks no attempt has been made to formulate a consistent system of design based on that knowledge. Some scoff at the idea that the fixed unit is necessary to obtain harmony, or that it may even serve as an aid in so doing. They argue that inasmuch as the work would be seen in perspective, the unit would be lost, but they deceive themselves, for the unit too is seen in perspective, and is by no means lost. The universal admiration which Greek proportions have always excited proves that the method used in obtaining them was correct.

It seems, indeed, too evident to need argument that one who uses in geometric design only such combinations of measure as are known to produce harmony should have a great advantage over him who depends on chance or guesswork for his results.

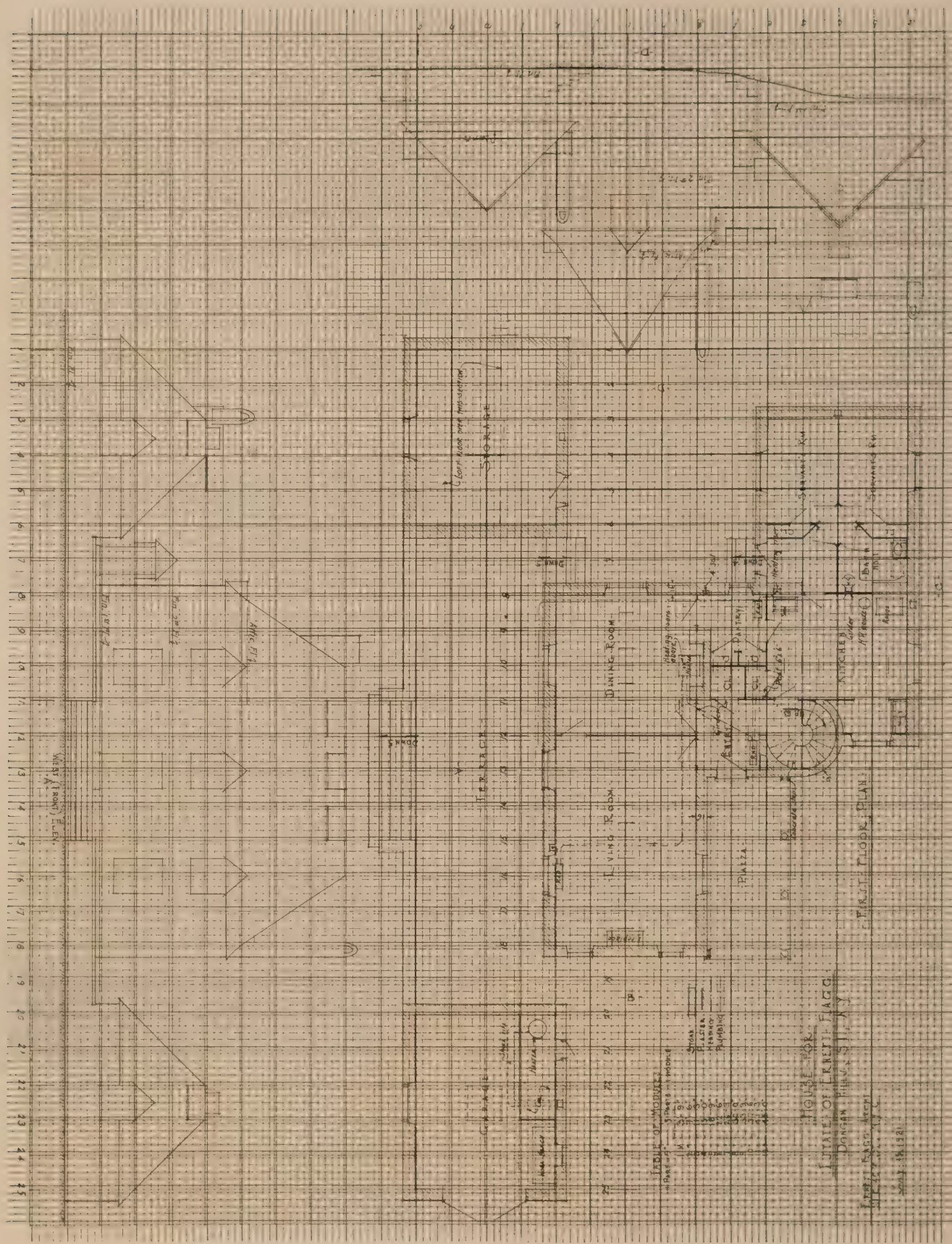
It is reasonable to suppose that when a fixed unit is used in harmonious combinations that the best and most striking effects would be had where that unit is seen or felt, like the measured beat in music or the cadence and rhythm in poetry.

That the Greeks thought so is sufficiently evident by the care which they always took in Doric buildings, to mark the scale on the work by the triglyphs. In other buildings of a later date, where doubtless, too, a module of some sort was used, perhaps they thought that the scale was sufficiently indicated by the features and details whose placing and spacing were governed by it.

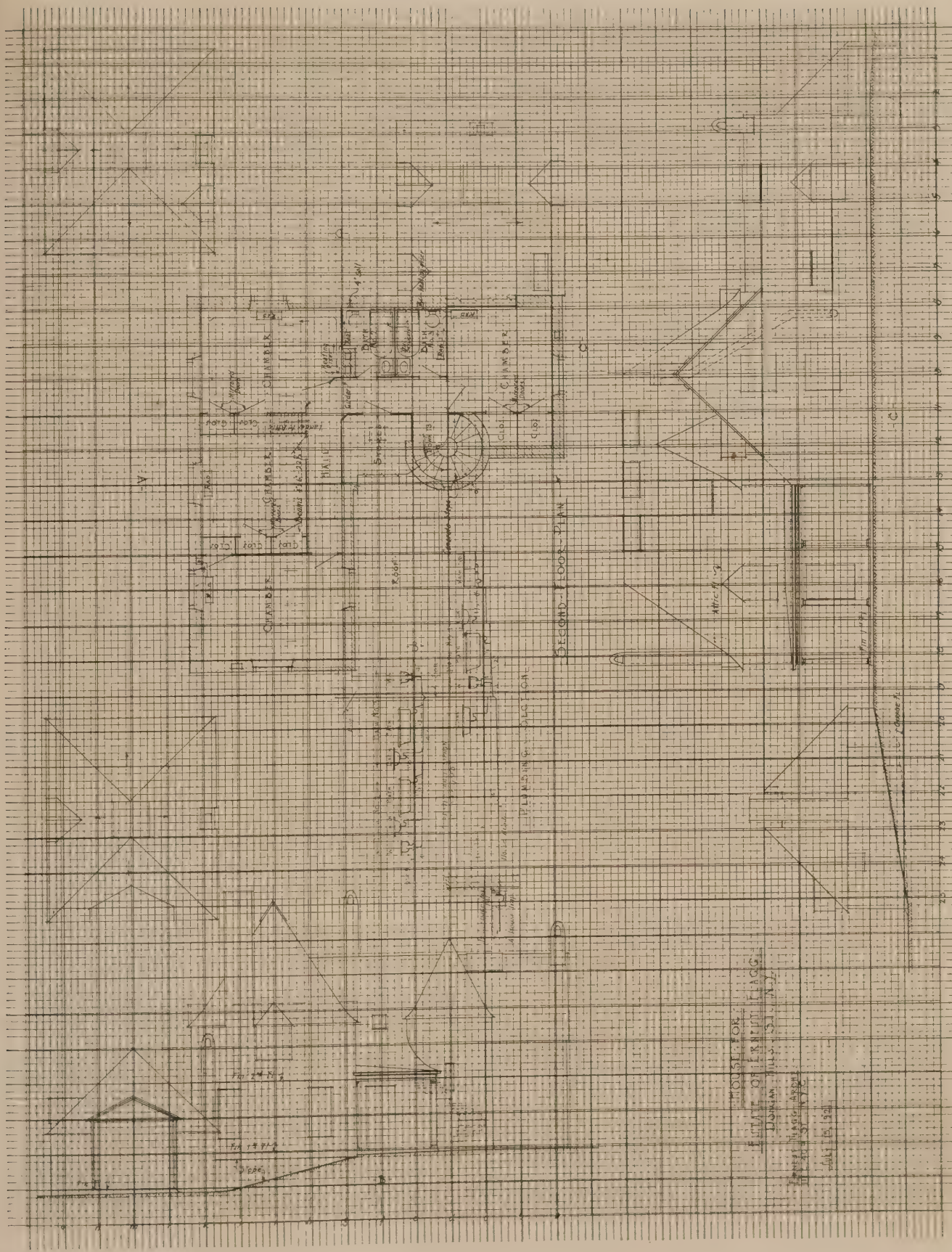
When using a module in architectural design, one necessarily accentuates the measure by its very use. Every feature being governed in its placing by the module becomes a reminder of the module's presence. As the regular unit exists everywhere throughout the composition, one uses it naturally and instinctively for all things requiring regular spacing. Just as all the greater dimensions are fixed by the unit and combinations of it, so also all minor spacing is obtained by subdivision of it. Balusters, frets, and all other kinds of running ornament, antefixes, cresting, modillions, beam and rafter spacing, and every other minor division of the sort, are most conveniently and naturally placed by subdividing the module. Thus, everywhere throughout the design commensuration and harmony both in the lesser and greater dimensions reign, simplifying and unifying the work. Such should indeed be the results; whether they are attained or not depends on the ability of the designer. Of course it is not contended that the mere use of a system of any sort is sufficient for the production of a work of art. To do that requires much more than can be supplied by theory or technic. The module will not endow the mediocre man with genius. He will be mediocre still, though he may do better than without it, but in the hands of the master it may become a tool of priceless worth.

It is not only in the higher branches of his art that the module may be of great service to the architect. For purely practical reasons the value of commensurability in all parts of the design cannot be exaggerated. One who has never experienced its benefits can form little idea of its usefulness. Without it a full standardization of parts is impossible. Where commensurability of dimensions does not exist special cases must abound, and special cases are the opposite of standardization. In making any design not governed

(*Continued on page* 318.)



ARCHITECTURAL DESIGN BY THE USE OF A MODULE.
Ernest Flagg, Architect.



ARCHITECTURAL DESIGN BY THE USE OF A MODULE. Ernest Flagg, Architect.

(*Continued from page 315.*)

by some fixed unit of measure of sufficient size to serve as a workable module, irregularities must creep in, and every such irregularity calls for special treatment; thus a great part of the value of standardization is lost. For instance, if a place is found where the standardized door or window will not fit, one must be designed and made which will fit, and to do that is generally, in each instance, as much trouble as to design and make the standard part itself. But where the fixed unit reigns throughout, all standardized parts will fit; no surprises occur, all axes are preserved, and every feature falls naturally into its proper relationship with all other features.

In nothing is this better illustrated than in the use of exposed beam ceilings. With common methods of planning, the use of such ceilings is so troublesome that they increase cost and they are, therefore, seldom found except in expensive buildings, whereas with the use of the module all that is troublesome about them disappears like magic. The spacing does not have to be thought of. The module or some subdivision of it determines that, everywhere, and exposed beam ceilings, instead of involving extra expense, result in great economy, as by their use much of the cost of plastering is saved and additional space brought into use.

Every one knows that in order to produce the best results in architecture, long and careful study of the design is necessary. The more important the building, the longer the required study. As architecture is now practised, it is only in monumental constructions that one expects to find the sort of planning which follows almost as a natural consequence from the use of the module. The preservation of axes, symmetry of arrangement, the proper and harmonious relationship of all parts to each other and to the whole, correct proportions, and the absence of all makeshifts in design, which are the marks of careful study, may be had almost without effort with the fixed measure.

Of course this does not mean that any good design can be made without careful study, but the presence of commensurability removes so many difficulties from the path of the designer that the process is made comparatively easy, and the design of a simple dwelling made in this way has about it that finish, harmony, and precision which one would hardly expect to find, under other conditions, except in the most carefully studied monumental construction. In advocating the use of the module in architectural design, the writer wishes to disclaim any intention of holding it up either as a sure receipt for good design or as a certain means of escape from bad design, but rather as a valuable tool which can be made use of by the designer in proportion to his abilities.

One of the chief benefits of the proper use of the module is that it so simplifies and lightens the work of the architect as to place it more directly under his personal control. By its aid he can, with his own hands, in a few hours, do work which without it would require weeks of a draftsman's time, and while greatly reducing his costs, it should lead him to much better results. As an illustration of the truth of this statement there is herewith reproduced the working drawings for a small house. After having designed the building, free hand, to a small scale on paper ruled with the module lines only, the writer made these working drawings (on sheets ruled with the module lines and parts, as may be seen) in exactly three hours. This included everything except the plumbing section and the strengthening of the lines in lead-pencil, which was done by a draftsman. As will be observed, few figures are necessary, and the making of the whole drawing probably required less time than would be needed for the figuring alone under ordinary methods.

It will be seen that the inside of all exterior walls runs on the module line. To face a wall, or pier on a line, is much easier, simpler, and more convenient than to centre it on a line. It is the most primitive and natural way of laying out work and evidently the method used by the Greeks, as any one may see for himself by drawing, on the plan of any Greek Doric temple, lines through the centres of the triglyphs in both directions. There it will be seen that the faces of the walls follow the module lines, and that the centres of the columns do not coincide with the intersection of module lines, showing that the columns were placed at least in one direction by lines tangent to the drums.

In general, great convenience results from placing the inside of walls on the module lines, for it insures symmetry in the rooms, though this would not always be true if partitions of the usual thickness were used. In houses designed by the writer the partitions are only 1¾″ thick, made by hanging a jute net and plastering both sides of it. The partitions are generally centred on the module lines, and as the distance from the centre of the partition to its face is ⅞″, the rooms would be out of true by that much were it not for the plaster on the outer walls which reduces the discrepancy to ⅜″, which is so slight as to be negligible. The accompanying figure, drawn to an exaggerated scale, will serve to illustrate this condition. Here the letters *m* indicate the module lines. The partitions *P* are centred on the module. The inside face of the walls are also on those lines, but the plaster on the walls is inside the lines.

A description of the method which the writer has found most convenient for laying out work on the ground may prove of interest to some. The chief module lines are first defined by driving stakes in the ground at the end of each such line and about 3′ beyond the inner face of the proposed wall. Cross-pieces are nailed between each pair of uprights at a uniform level, above the proposed finished ground floor. On each cross-piece a nail is driven exactly on the module line, so that a string drawn from one nail to its opposite will exactly coincide with the module line. When this is done, trenches for the foundations are dug outside the proper lines. The foundation walls are then built and finished off true, smooth, and level all the way around to the height of the damp-proofing, which is 2″ below the finished floor. When that is done the module lines, as indicated by the strings, are marked on the work, after which all other modules are easily, quickly, and exactly marked on it by the use of module scales or poles. By this method the utmost accuracy is obtained, and the work proceeds with an exactitude quite unusual in ordinary construction of this class.

It has been found that nothing is more conducive to speed in building by this method than great accuracy in laying out the work. If started right, in this way the building proceeds in a most delightful fashion. Everything fits exactly and the various parts go into place like pieces in a house of blocks. The accompanying photograph shows the layout on the ground of the main module lines of the house, the plans for which are here given. In this case the cords are set at 18″ above the finished ground-floor level of the main part of the house. Lines for the storage building and garage were not in place when the photograph was taken.

The Problems of the Young Draftsman

By David B. Emerson

THE young man fresh from college or a technical school on entering an architect's office will begin to find himself confronted with many problems both new and difficult. To be sure, he has probably worked in offices during his vacations, but such work was not taken seriously, nor was he taken seriously, for who ever took a vacation worker seriously? Now, it has become a decidedly different matter; actual work has really begun, and the question is one of either success or failure.

One of the very first things the beginner in an office will rapidly learn is the great difference between the "projet" and the "job," the ideal and the actual, between school drawings and working drawings. The great majority of the young men who graduate from the bulk of the architectural schools are very well grounded in a knowledge of the orders, but they are wofully lacking in a knowledge of architectural styles. Given a fairly simple design to make in any one of the many different styles that are in current use, he flounders hopelessly because of a lack of fundamental knowledge of the style.

All really good offices have good libraries, and a young man starting in an office should become acquainted with the library, and learn to use it intelligently. Unless a young man is exceptionally talented and shows great aptitude in design, he will very likely be called upon to make working drawings and details, rather than to design and make sketches; also, he will have to work with one or two other draftsmen getting out the drawings for a building, and then he will begin to learn the value of team-work and close co-operation. The writer very well remembers one talented young draftsman who was put to work helping him on a building where the grade levels had been very carefully worked out, and without consulting any one he added one step to the front entrance, "because it looked better." Such things are occurring constantly, because of the lack of team-work and co-operation. In school a man generally works alone; in an office he must almost always become a part of a working team.

In making working drawings, especially in residential work, it is very necessary to make proper provision for plumbing fixtures and other utilities, and very often the young draftsman runs amuck with these necessary details, showing kitchen sinks either twice their size or half their size; bath-tubs are sometimes drawn six feet long when a five-foot tub is all that is needed or wanted. The construction of chimneys and fireplaces should also be carefully studied, as a great amount of trouble and worry is occasioned on the work by the improper drawing of these items, and oftentimes in order to construct them at all changes have to be made which mar the design of what would otherwise have been a charming room. The failure to allow sufficient head room in stairs is the "bête noire" of most young draftsmen. The majority of them forget to allow for the thickness of the floor and for the thickness of the stair-run above, both of which have to be considered. Also, there is a tendency to figure too closely, and as a result the header will be too close to the nearest riser, and a tall person will bump his head going down the stairs. The under side of the header should always be at least seven feet above the tread below.

One of the most troublesome problems a draftsman will encounter in his work is that of allowing sufficient room for boiler and fuel rooms in the larger class of buildings. Very few, if any, of the younger draftsmen, as well as some of the older ones, appreciate the amount of room required for these utilities, consequently in many otherwise well-planned buildings, when it comes to installing the boiler or boilers, as the case may be, it will be found that they are badly cramped for room. To add to the trouble, the fuel-room will be found to be entirely too small and only half enough coal can be stored at a time.

The best plan is, when the building has been tentatively planned and it is possible to approximate the radiation, to have a heating contractor to roughly figure it out; then get the size boiler required, allowing a little leeway for any possible miscalculation. Then lay out the boiler to scale from the diagrams in the catalogue of the boiler manufacturers, being careful to allow a fair amount of room on all sides for working space. If a cast-iron boiler is to be used, allow sufficient room in front of it for firing; not less than five feet. If a steel boiler is to be used, allow enough room in front of it for drawing tubes, that is, at least the length of the tubes in front of the boiler.

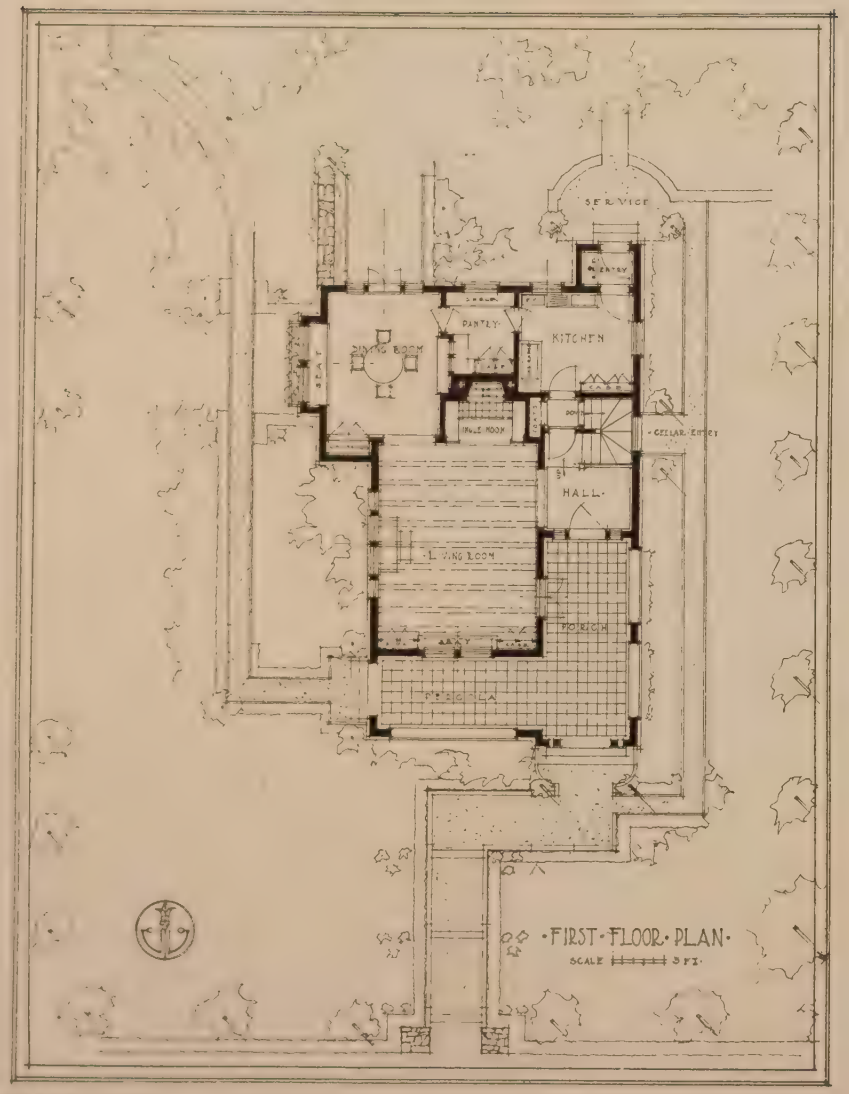
Quite as important as the floor space in the boiler-room is the question of the head room; therefore, find out from the heating contractor how much head room is needed and then allow a little more for possible contingencies. Make careful inquiries and find out how large a supply of coal the owner wishes to carry. Some owners like to put in a season's coal at a time; others are satisfied to carry only a month's supply. With this information figure out the capacity of the fuel-room, allowing about forty-five cubic feet to the ton of coal. All of this may take a little time, but it will be time very well spent and may save lots of time and worry later on.

These are only a few of the many problems that come up in the workaday life of a draftsman, but most of us have fallen down on some or all of them. It may be well to repeat here for the benefit of the young draftsman what the late James Renwick, then an old man, said to the writer years ago: "Young man, always remember this, the foundation of all good architecture is common sense."

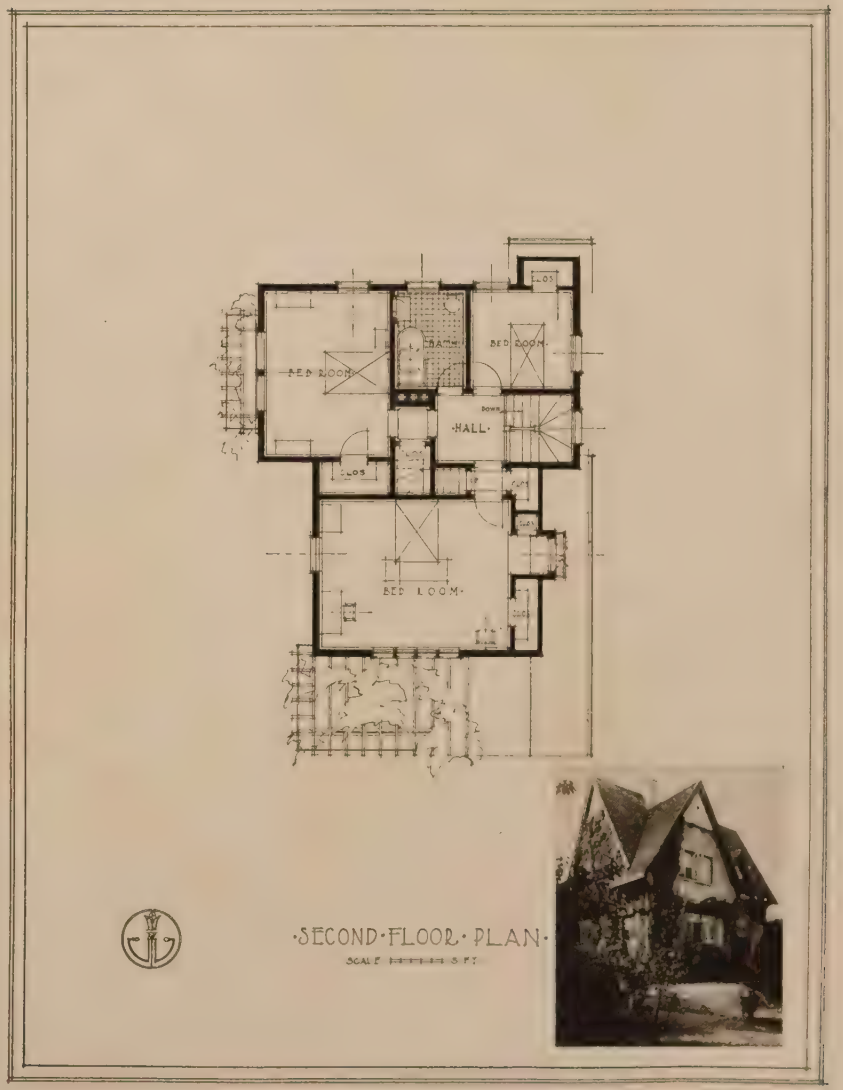
Announcements

John N. Tilton, Jr., of Marshall and Fox, architects, announces that he is continuing the practice of architecture established in 1882 by his father, the late John N. Tilton. His offices are at 123 South Kensington Avenue, La Grange, and 721 North Michigan Avenue, Chicago.

Mr. Harold P. Bergen announces the opening of an office at 607 Worcester Building, Portland, Oregon, for the practice of architecture. Mr. Bergen is a graduate of Columbia University, of New York City, and has lately been associated with Mr. Thomas W. Lamb as manager of his Canadian office.



PLANS, HOUSE, C. C. WENDEHACK, MONTCLAIR, N. J.



C. C. Wendehack, Architect.

HOUSE, C. C. WENDEHACK, MONTCLAIR, N. J. C. C. Wendehack, Architect.

The Timber Supply

WITH the addition of the present growth of new timber, at the annual rate of approximately 20,000,000,000 feet, there is now standing in the United States enough timber to secure a supply of raw material for the lumber industry for over one hundred and fifty years, according to the secretary-manager of the National Lumber Manufacturers Association. He adds that the excess of exports over imports may somewhat increase the annual drain upon our forests, but thinks it exceedingly doubtful whether the total domestic consumption will much, if any, exceed to-day's figure, which is less than 33,000,000,000 feet a year.

Because lumber production is below normal and stocks are low, many persons make the mistake of supposing that the timber resources of the country are fast failing, and that they must look about for some substitute material for wood.

With the diminishing of the timber supply is the not less important fact that not so large a supply as formerly will probably be needed in the future, as standards of wood utilization and methods of living change, and demands vary in different generations.

Before worrying over a timber famine and demanding that more trees should be planted, public and private interests should both look to the conserving of the timber resources they now possess. There should be more adequate public protection from fire and insects, and private care in preventing animals from uprooting seedlings, and in not injuring trees by turpentining and similar processes.

Many years ago in the Senate there was predicted an early timber famine, and among other scare-inspiring things it was said that the white pine of the Northern forests would not last more than ten years. There is still some white pine left, and there is now more timber standing than these senators believed existed in the whole country at that time.

Preventive measures are urgent, as is evidenced by the recent terrible fires in the great Northwest forests, but these measures with natural replacement will accomplish much to keep up an adequate timber supply for future generations.

The reason for present higher prices of lumber is the high rate of transportation added to decreased production and scarcity and incomplete assortment of stocks, and this is caused largely by wages and other higher costs of production. In 1918 lumber production was only 72.7 per cent of what it was in 1913, and it will probably not be very much more than this in 1921. Increased production should follow a settlement of labor difficulties, especially if the industry does not then have to bear a big increase in transportation costs.

Adaptability of Wood

WOOD is so adaptable to every construction use that a great many persons think all it needs is the carpenter, says a prominent lumber authority, but it must be remembered that some wood is more adaptable than another to a certain purpose; also that while it may be that in other forms of art "the more difficult the medium, the greater the art," in architecture the more adaptable the medium, the greater the possibilities of true art in its use, and true art must include a certain amount of restraint.

Wood is not only adaptable to art and to permanency but it is adaptable to change, not simply the change here and there of a detail during construction but the change that is inevitable to all construction in the course of time, as the adding of a new wing or a sleeping-porch to the home, the converting of a stable into a garage and minor changes which are necessary to install newer methods of ventilation. There is always a little changing and in the course of a generation or two this changing is an important feature to be considered. It is in this respect that the adaptableness of wood may be emphasized.

The builder must use wood intelligently and look to the proper construction of chimneys and other vent shafts, as nearly half of all fires may be traced to faulty construction in chimneys or fireplaces.

Insignificant Fire Hazard from Shingle Roofs

THAT fire loss because of sparks on roofs is extremely insignificant as compared to losses from other causes is strikingly shown in the recently compiled schedule of losses paid in 1918 by The Lumber Fire Mutual Insurance Company.

The main causes are arranged below in the order of losses in dollars paid in 1918, and they not only indicate where preventive measures are most necessary, but they furnish another argument in favor of not eliminating the use of shingle roofs. This comparison is valuable to lumbermen as it helps substantiate the fact that wooden shingle roofs, about which so much has recently been said, are not the fire hazard which they are claimed to be by some agitators.

1. Sparks arising from combustion, as from chimney, defective boilers, railroad locomotives, $49,025.10. 2. Incendiary, $32,356.27. 3. Conflagrations from buildings and forest fires, $29,252.67. 4. Exposures, $21,878.40. 5. Smoking, $14,680.77. 6. Electricity, $12,321.29. 7. Friction from running machinery, $10,342.31. 8. Stoves, furnaces, etc., $915.96. 9. Chimneys, flues, etc., $870.38. 10. *Sparks on roofs*, $46.62.

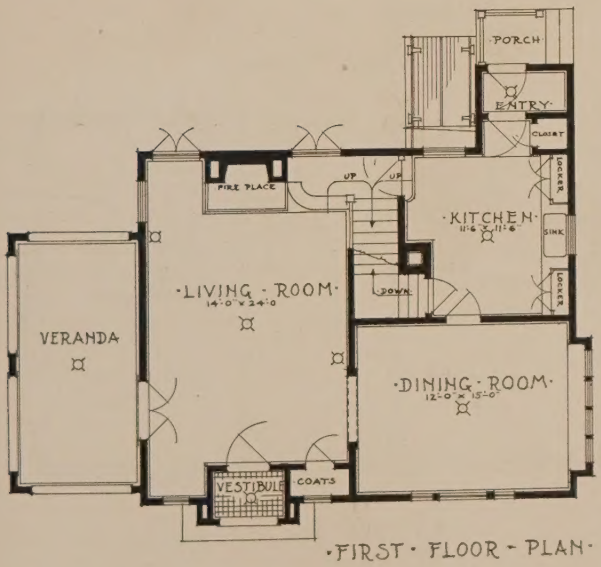
Forest-Fire Losses

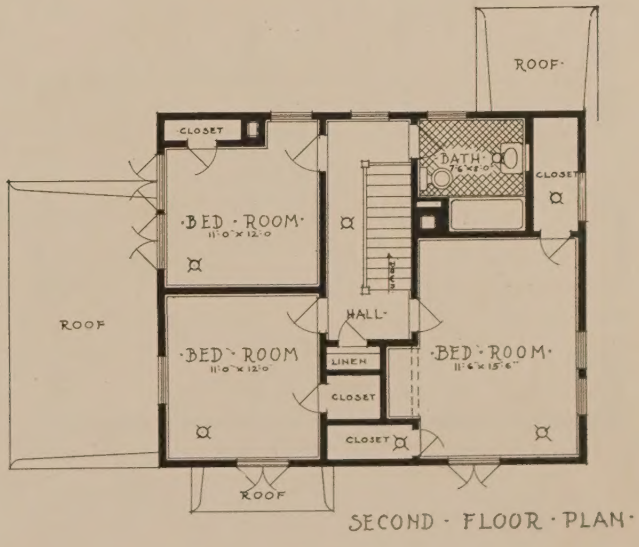
TWO-THIRDS of Canada's forests have been destroyed by fire in the last seventy-five years, according to figures of the forestry department of Canada. The amount of timber burned would have supplied the world for four hundred and fifty years, at the present rate of consumption, and represents a loss of a billion dollars.

Canada still has 1,900,000 square miles of forests, the forests of British Columbia constituting one of the two greatest tracts of commercial timber in the world, the other being in Russia.

Forest-fires in this country are designated by Colonel W. B. Greeley, forester, as "the chief cause of forest devastation," and he urges most emphatically the immediate need of a nation-wide drive against the forest-fire.

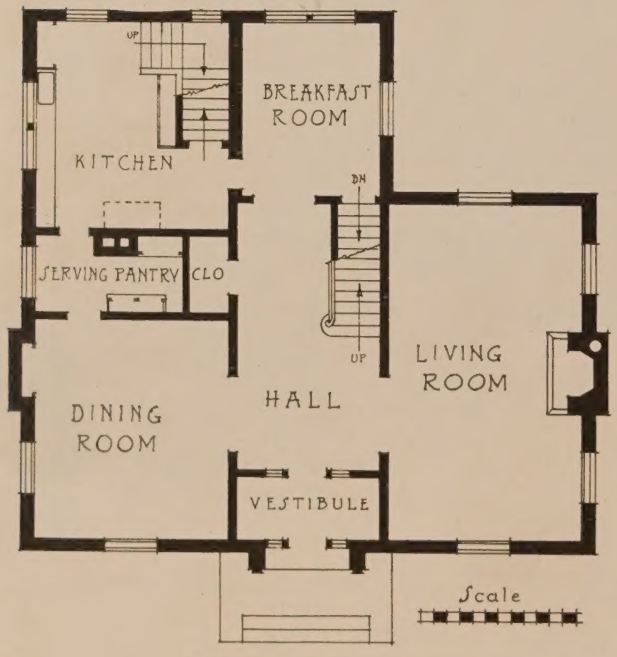
Not only have great forest-fires visited this country since the landing of Columbus, but large tracts were swept clean of timber before a white man ever used an axe here. An eminent scientist and historian, according to the *American Lumberman*, states that if the discovery of America had been postponed five centuries, the discoverers would have landed on a treeless continent. Indians and lightning set these fires. The Indians were burning the woods to make pasture for deer and buffalo. Most of the forests had been destroyed in the region between the Rocky Mountains and the Mississippi River before the advent of the white man.



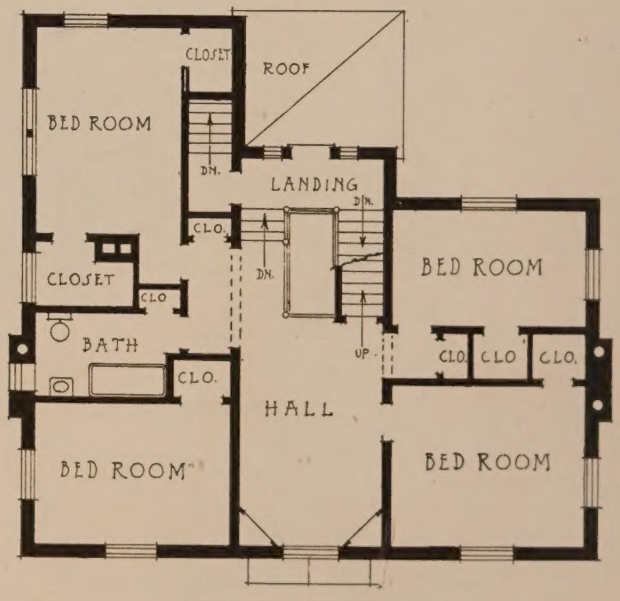


HOUSE AND PLANS, GEO. C. ROSS, NEW HAVEN, CONN.

Shiner & Appel, Architects.



FIRST FLOOR PLAN



SECOND FLOOR PLAN

HOUSE, F. S. MILLER, ROCKWELL CITY, IOWA.

Damon & O'Meara, Architects.

TYPICAL PARISH CHURCH OF THE MARNE AND MEUSE, FRANCE.